SCIENTIFIC AMERICAN

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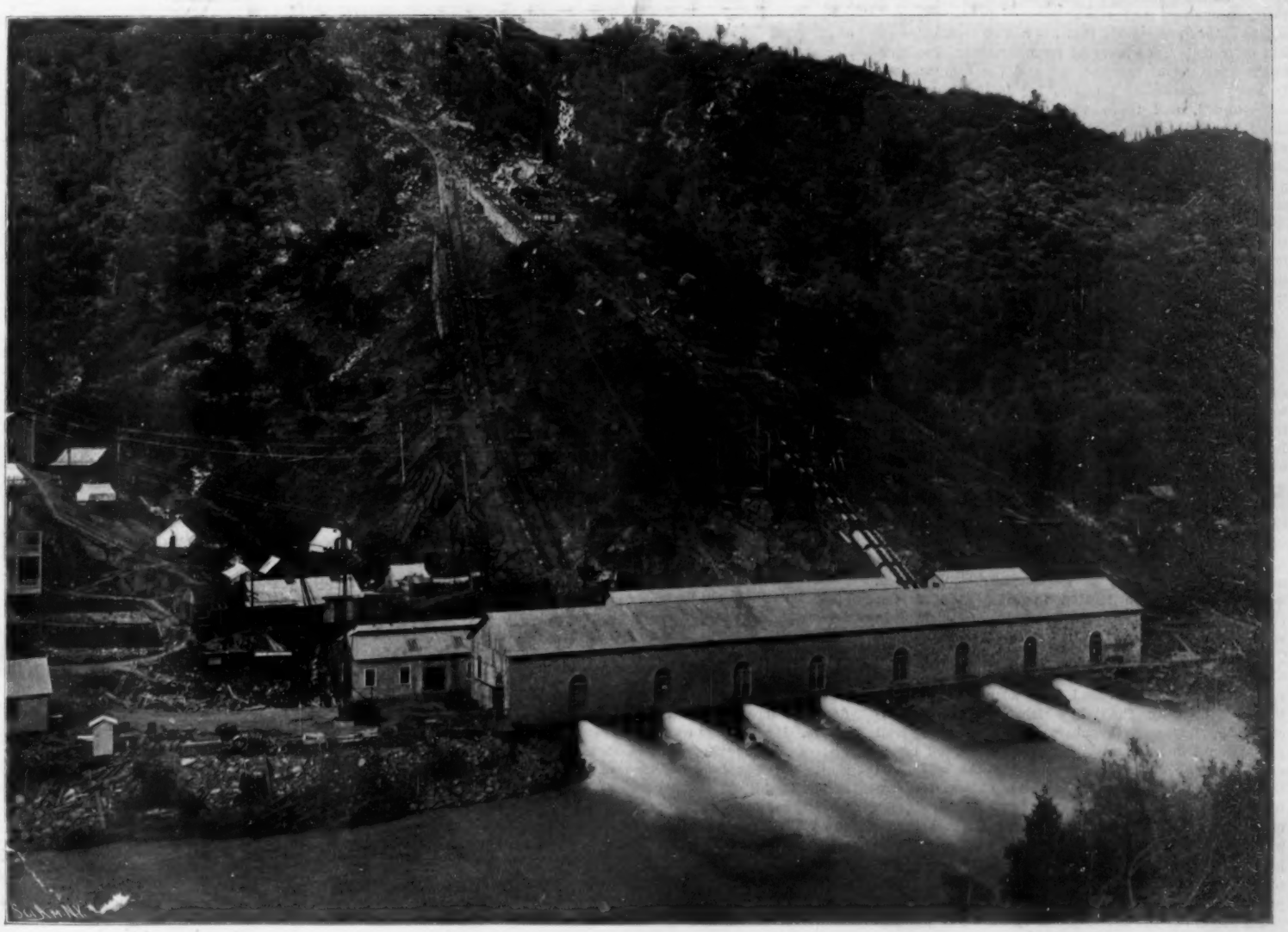
Where the Filling of the Dam Confining the Reservoir is Being Sluiced in.



The Power House at Colgate.

LONG-DISTANCE HIGH-TENSION TRANSMISSION OF POWER IN CALIFORNIA.—[See page 373]

SCIENTIFIC AMERICAN

ESTABLISHED 1845

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NEW YORK, SATURDAY, MAY 16, 1903.

The editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

WE NEED FEWER DOCTORS.

The other day at the convention of the American Medical Association, in New Orleans, where some 4,000 or 5,000 physicians and attendants were gathered, Dr. Billings drew attention to the decided oversupply of medical men in the United States. He attributed the surplus to the fact that the medical colleges are graduating annually from 10,000 to 12,500 physicians, when the actual needs of the country call for only about 2,500. If Dr. Billings is correct, and there is no reason to doubt his figures, from 7,000 to 10,000 young men are annually entering a profession in which they have but the slimmest hopes of making even the proverbial "comfortable living." Of course, it goes without saying that most of the professions are more or less overcrowded; but we doubt if any of them, except the Law, could afford a parallel to the condition of things brought to light at the New Orleans convention. What this disparity between the demand and supply means to this army of young men, can only be surmised; but certain it is that in the majority of cases it will involve the loss of much money, that can ill be spared, and much time, that can be spared still less. It does really seem a pity that some of these graduates have not entered other professions that are not so crowded, and can offer better prospects of remuneration. Sanitary engineering, naval architecture, and the comparatively new profession of forestry, for instance, are not overcrowded, and there will soon be a great demand for really competent automobile engineers, men who combine with mechanical ability a thorough knowledge of gas and other engines that are competing for the control of the field. Then there is the sphere of journalism, which, while abundantly supplied as to numbers, is pitiably supplied as to quality. There must be among those thousands of graduates not a few young men who have a natural gift for good writing—in these days an all-too-rare accomplishment that threatens to become a lost art.

THE PROPOSED BROOKLYN BRIDGE TERMINAL STATION.

What has become of the Mayor's or, to speak more correctly, of the Bridge Commissioner's proposed railway terminal at the Manhattan end of the Brooklyn Bridge? As suggested by Mr. Lindenthal, and laid before the Board of Estimate by the Mayor, the scheme contemplated the construction of a terminal which was to take in the subway, surface and elevated railroad systems, which now meet near the entrance to the Brooklyn Bridge; while above the terminal was to be erected a great municipal building, of such capacity that it would be possible to gather together under one roof the various city departments, many of which are located in different buildings throughout the city, and are therefore paying rents which aggregate yearly a very large sum of money. The proposal was to acquire several triangular plots of land in the immediate vicinity of the Bridge terminal, and above the ground thus acquired erect the proposed building, through which, by means of arcades, the traffic of Chambers Street and City Hall Place would find its way. Into the three-deck terminal below the city offices would run the cable and trolley cars that cross the Brooklyn Bridge, the surface cars of Fourth and Third Avenues, the tracks of the present rapid transit subway, and those of the proposed tunnel connecting the Williamsburg and Manhattan Bridges with the Brooklyn Bridge. Among the many improvements, most of them excellent in theory, proposed by the present administration, we know of none, outside of the contemplated extension of the subway system, that would confer more benefit on the traveling public.

"RELIANCE" AND "COLUMBIA."

Because the "Reliance" and "Columbia" happened to get in close company during their tuning-up work on Long Island Sound the other day, and the old boat seemed able to hold her own with her big sister, quite a little thrill of excitement, with some trepidation, was felt throughout the yachting circles on this side of the water.

As a matter of fact, the result was exactly what we predicted in these columns, the "Columbia" with her small wetted surface and generous sail plan proving equal to the "Reliance" with her large wetted surface and greater spread of canvas. Had there been a disturbed sea, the "Columbia" would probably have pulled away quite easily from the big boat. Let the two meet, however, on the Sound in a whole-sail breeze with started sheets, and there will be a very different story to tell. At the same time, there is no denying that the "Columbia" has a rare burst of speed in her in a strong wind; as witness her magnificent run on May 3, when in a piping breeze that held true throughout the run from Newport to City Island, she averaged for over one hundred knots of the course a speed of nearly fourteen knots an hour. It is probable that she was favored somewhat by the tides.

OUR ENORMOUS EXPORTS.

It is estimated by the Treasury Department that the exports of the United States for the current year will reach the great total of $1,500,000,000. It is interesting to note the growth in our exports during the past four decades. In 1870, for the first time, the total reached the $500,000,000 mark; and it took twenty years longer for the figures to swell to $750,000,000. In 1897 they reached the grand total of one billion dollars, and a 50 per cent increase was recorded in the half-dozen years that followed. The growth of imports has been always steady, and during the last five years remarkably rapid. In 1895 our imports amounted to $705,205,585. Five years later they had reached $838,761,870, while for 1903 they amount to $1,001,596,683. It is the ever-growing demand for manufacturers' materials that is responsible for this rapid increase. In the month of February last manufacturers' materials alone constituted more than one-half of the total imports.

WHAT TO ABOLISH FROM WARSHIPS.

In discussing the many conflicting theories as to what should be got rid of in warships in order to reduce their ever-growing weight and size, our esteemed contemporary, the Engineer, of London, says: "The Americans have abolished torpedoes altogether; and it may be added that the French and Germans have abolished nets. The Germans have abolished wood. If all accounts are true, the Spanish and Chinese have abolished guns, and the Turks, screw propellers also, though the Italians—who have a reputation for building light ships—still supply big four-poster beds for senior officers." The fact of the matter is (and we say it with all due deference to Admiral Dewey and the school that believes in smaller and lighter battleships), what is needed to-day is not the abolition, but the introduction of weight. Guns, torpedoes, armor, conning towers, a generous ammunition supply, powerful engines, reliable gun-mounts, good coal capacity—all of these are necessary, and all call for weight. If we are to have our fighting line made up of battleships and cruisers, this means, and always will mean, that we must have big ships. We do not need to take away, but to add; and evidently, if the experience in the "Maine" is any criterion, the addition must be in the direction of such weight as is necessary to give proper structural strength all round. It looks as though modern battleships, cruisers and torpedo boats were suffering from the same cutting down of weights that is causing such trouble in our big modern racing yachts.

THE METRIC SYSTEM.

Many of the opponents of the metric system base their unwillingness to adopt it on the fact that it is decimal; others only on the ground that it is metric—i. e., based on a unit that is nearly 40 inches long instead of one that is 36. As regards the decimal end of it, there is not one of the American objectors who goes to England, who does not complain of duodecimal currency with its various disadvantageous side issues. He finds his own dollar easily enough divisible and easily enough computed in all its divisions and multiples; but he complains of a 20-shilling pound and a 21-shilling guinea, and of the steps 4 x 12 x 20 on the road from farthing to pound. He never confuses the 20 hundredweights of 100 pounds each and the 20 nominal hundredweights of 112 pounds each, for although 2,240 pounds make the only legal ton in the United States, he uses almost exclusively 2,000. He forgets all our "troy" and "apothecaries'" weights, the tables for which used to wear out his soul when he was a boy, and which at forty years of age he cannot repeat. He probably uses for fine work, if he is a machinist, decimal divisions of the unit, or of one-third of the unit, as our United States standard is the yard, not the foot, in preference to the carpenter's eighths and sixteenths. He has no difficulty in laying out or laying off a third or a quarter of an inch on a decimal scale.

Those who base their objections to the system on the meter only, would do so were it divided into twelfths. They seem to think that if we were to measure in meters, we would have to change all our patterns. As a matter of fact, we would not. The designer who has any common sense and experience makes his drawings to some near unit which will give him enough stuff to bear the load or do the work. He gives himself a factor of safety according to the character of the load; and if the dimension were 39.4 instead of 40 inches, it would not cause him any worry nor make his work any the less reliable or suitable. A 3-inch shaft, so called, is really 2 15-16 inch about nine times out of ten; and no one complains of weakness because it is not just 3 inches. No one objects to putting in cold-rolled shafting because it is an even 3 inches on the so-called 3 inches size, instead of only 2 15-16. There is no confusion.

It will probably be a long time before British insular prejudice, some of which we have inherited, will consent to the adoption of either decimal subdivision or the metric unit, alone or in combination. Meanwhile there is one thing which we can do, so long as we are saddled with our present standards and subdivisions—that is, express dimensions in inches instead of in feet and inches. For instance, we can avoid writing 5′ 1″, and instead write 61 inches; because the 5′ 1″ is liable to be read 51 inches. There are times and places when such misreadings can be not merely annoying, but very expensive.

THE FIRST IRON SAILING VESSEL.

Some interesting facts have been published in England concerning the first iron sailing ship which set out from Liverpool, and its commander. The vessel with this unique distinction was the "Richard Cobden," commanded by Thomas Lidbitter. This craft was built of Coalbrookdale iron, and was launched in 1844. She was a bark of 461 tons, and had a speed of 10 knots per hour. She was constructed of iron throughout, including the rudder, rudder frame, and steering gear. Her lines were very fine, and she was five times her beam in length. She was without bulkheads, and in sailing trim she lay on an even keel. She had a great rise of floor, falling in somewhat from her bilge to the rails. In 1844-45 she set sail for China, but was laid up twice for repairs at Cork and Rio de Janeiro respectively during the passage. She aroused considerable attention at the various ports at which she called, as she was the first iron vessel ever seen, and was regarded somewhat suspiciously by the superstitious, to whom the idea of making iron float was considered as flying in the face of Providence. Her second voyage was to Bombay *via* the Cape of Good Hope and back. She covered the round trip in some seven months, which was considered a remarkable performance. She made another journey to Bombay, which she reached in 94 days. On none of these trips did the vessel make any water, so that the feasibility of utilizing iron for vessels was firmly established.

The next vessel commanded by Capt. Lidbitter was also an iron vessel launched in 1853. She was 192 feet in length, 32 feet beam and 22 feet depth. She was a three-masted craft, and was provided with an iron bulkhead abaft each mast. Like the "Richard Cobden," she was without steam power. Her first voyage was from London to Bombay, Calcutta, and Melbourne. She covered the distance between the two last named ports in 60 days. In June, 1854, she left Melbourne for home with a large and valuable cargo of wool and £300,000 in gold. The captain intended to round Cape Horn on this trip, but after passing Tasmania the ship sprang a leak during a gale, and as she listed with dangerous heaviness to port, the captain beat his way northward to Tahiti, and Papate was safely reached, but the vessel had only been kept afloat by three weeks' incessant pumping. At Papate the ship was pumped out and examined, and the leaks were found on both sides of the ship, abreast the mainmast. Three hundred rivets were knocked out and renewed before the vessel was again ready for sea. When the repairs had been satisfactorily completed, the captain again set sail, and this time safely reached London in March, 1855. The vessel was again overhauled, and the springing of the leaks was found to be due to the keelson, which instead of being made solid from end to end, was constructed in three unconnected lengths separated at the fore, main, and mizzen bulkheads respectively, and these bulkheads were found to be far too weak to withstand the enormous strains set up. The defects were remedied, and the vessel made numerous voyages, principally between Philadelphia and New Orleans, and was finally stranded in the northwest Providence Channel. More than thirty salvage ships undertook to refloat her, but as they demanded a payment of $30,000

before commencing operations—a sum considered prohibitively excessive—her captain abandoned her, and she rapidly became a total wreck.

CHIMNEY DRAFT.

BY EGBERT P. WATSON.

A column of rarefied air is lighter than a similar column of cold atmospheric air, volume for volume, and from this fact a theory has been deduced to account for the existence of draft so called in chimneys. The velocity of an ascending current in them is based upon the difference in weight of rarefied and unrarefied air, but, unfortunately for the stability of the theory, the same phenomenon, if it may be so called, exists in a cold tube which has no rarefied air in it. I have just taken a length of stove pipe, cut a small opening in the bottom, and set it on end; when a lighted match was applied to the opening, the flame was strongly drawn in, showing the existence of an upward current in a cold tube. If there was not such a current, it would be a tedious task to rarefy the air in a large chimney; but every housewife knows that so soon as a fire is started, it commences to burn. Chimneys that never had a fire in them work well when properly built.

In a certain sense this is peculiar, paradoxical even, for from the latter postulate there does not appear to be any reason why setting a tube on end should cause a circulation of air through it; and if it is desirable to have a theory to account for every occurrence in nature, it will be necessary to construct a new one for the draught of chimneys, for they do not follow the present alleged law in all cases; in some they act entirely contrary to it. Currents of air move in all directions in nature, horizontally and downward; sometimes it seems, in a chimney which does not work well, as if all these things occurred at one and the same time. Opening a door or a window causes a draft, the heated air in the room being displaced by the colder air outside, and external objects, both natural and artificial, cause barriers which deflect currents so that they literally fall down the chimney, or drive the heated air down, which is the same for practical purposes.

The conditions under which draft exists or does not exist are very puzzling sometimes, in practice, and give rise to much speculation as to the causes. Take the case of a flue which has been used for forty years, and during that period has had five or six different stoves attached to it; every one of these stoves gave trouble, and would not burn the coal properly until they were adjusted to the conditions prevailing, whatever they were. This flue was crooked; that is to say, for reasons connected with the building it was carried up straight ten feet from the bottom, and then run at an angle of forty degrees for ten feet more; the flue was then carried up straight for ten feet to the roof, through which it projected six feet. The mason who built it said it would not draw, but in spite of his prediction it drew admirably, and continued to do good service until some alterations were made in the building, when the chimney was run straight for the entire length. Then trouble began. A stove that had always worked satisfactorily, sulked and protested against the new chimney.

This last was thoroughly dried out, and being of glazed pipe was absolutely clean and true throughout. The smokepipe entered the chimney near the bottom and had a straight shot clear to the upper end; there was every reason why it should have had a great pull on the fire, but there was a very feeble one. Not knowing what else to do, I had the pipe taken out of the bottom of the flue and run off at an angle, entering the flue by short-connected elbows ten feet higher up, giving a crooked flue again. This started everything going in great shape, and the stove had to be checked in every possible way in order to prevent it from getting white hot in no time, so to speak. This is contrary to all precedent and common sense, but the sequel to the history of this flue is still more surprising. The stove was changed in due time for another of different make, but with the same sized flues in it as the discarded one, and of the same general design; when it was attached or connected in the same way that the other one was, nothing could be done with it, the fire smoldered instead of burning, and was useless for cooking.

There was a fire-brick in the back end of the new stove, which had been loosely put in, so that one end was cocked in toward the furnace, or firebox, leaving an opening of about three-eighths of an inch by nothing on the other end. It did not seem possible that such a small leak could seriously affect the action of the stove, but it did materially, for after stopping it with fire-putty it worked well and is now all right. The reason for this improvement is that the cold air entering the ashpit was short-circuited; instead of going through the fire it went through the leaky fire brick, not only cooling the smoke-pipe, but also robbing the fuel of the oxygen it required for combustion.

Stoves are sometimes blamed for faulty construction when the trouble lies elsewhere—in the way in which they are connected. One large heater which had always performed well was taken down during housecleaning, but when it was erected again it would not draw at all. Investigation revealed that it was too far out from the chimney-breast; the stove-pipe barely entered the breast by an inch or so, when it should have gone clear through into the flue itself. Singular as it may seem, the up-draught from the flue constituted a cut-off for the smoke-pipe; when this was changed, there was no more trouble.

Again, a factory chimney which had always worked perfectly for many years suddenly refused duty; upon investigation it was found that the blank wall of a recently erected building in the vicinity, during the prevalence of winds from the northwest, deflected a current which came down the factory chimney, constituting a back draft. This blank wall was about three hundred feet from the factory, and it seemed scarcely possible that it could have the effect mentioned, but it did, for after the chimney was hooded there was no more trouble.

Draft, so called, even when apparently strong, is relatively of very little force, for natural draft can be of great vigor, seemingly, and show nothing on a draft gage; tinder from burned paper will so obstruct the grate bars that the fire will not burn until it is removed, and this tinder is such a flimsy material that it cannot be picked up with the fingers; it crumbles at the slightest touch. A roaring draft, so called, is not caused by the force of wind rushing through the grate bars, but results from the combustion of the air and gases; an infinite number of minute explosions merge into a continuous rumble accompanied by vibrations, which sometimes shake heavy boilers so violently that they alarm the attendants; there is no danger attending such manifestations, except that of the gases collecting in pockets or corners to such an extent that they explode in one volume, blowing the furnace doors open and scattering the fire over the fire-room. Back draft of this character is easily stopped, so soon as the humming begins, by scattering fresh coal over the black spots in the fire.

One of the most peculiar arrangements of a chimney and its connections that I have ever heard of exists in Belgium, where a factory stack is set up on a hill, and connected to an underground conduit communicating with the boilers in the valley below. The part underground is horizontal for about one hundred feet, and is necessarily cold for a long time after the fires are started; the chimney is also cold, nevertheless the stack exhausts the conduit, or underground flue, so soon as fires are started under the boilers. There must, then, be a strong upward current in the stack itself at all times in order to exhaust the horizontal flue, which is merely a drag, or baffle on the stack. Rarefied air has no part in the action of this stack until the fires are under way.

TRADE-MARKS IN THE PHILIPPINES.

A new trade-mark, trade-name and unfair-competition law has been enacted by the Philippine Commission which repeals the royal decree of 1888 for the registration of trade-marks, as continued in force by military orders, and provides for an independent registration in the Philippines. Owners of trade-marks and trade-names who are domiciled in the Philippines, or the United States, or in foreign countries which grant similar privileges to persons domiciled in the United States and Philippine Islands, may register their marks and names under the new law.

The law defines trade-marks and specifies the requirements for their registration. Provision is also made for the registration of trade-names, which the law defines as names, devices or marks by means of which is intended to be distinguished from that of others, the business, profession, trade or occupation in which one may be engaged. It is not essential that the trade-name should appear on the goods dealt in by the person using the same, as it is sufficient if it is used by way of advertisement, or on letter heads, signs, or in any other way to furnish to the public a method of distinguishing the business.

Unfair competition, and the infringement of trade marks and trade names with intent to defraud the public or the owner of the mark or name are made crimes and the guilty party may be severely punished in the criminal proceeding, in addition to the loss which he may suffer because of the damages which the wronged party may recover in a civil action.

One of the sections of the law provides for the registration of trade marks in the Philippines in order to enable persons domiciled in those Islands to register their trade marks in foreign countries, the trade mark registration laws of which require the registration in the home country as a condition precedent to registration in such foreign countries. The persons domiciled in the Philippines may now register their trade marks in those Islands and in foreign countries, but they are still unable to register their trade marks in the United States because of the ruling of the United States Patent Office that provision for this registration is not made in our our trade-mark law, which only provides for the registration of trade marks which are owned by persons who are domiciled in the United States or who are located in a foreign country which grants reciprocal rights.

It is to be hoped that this decision may be overruled or that the defect in the United States trade mark law may be corrected in order to enable persons domiciled in the Philippines to secure complete protection for their trade marks by registration.

SCIENCE NOTES.

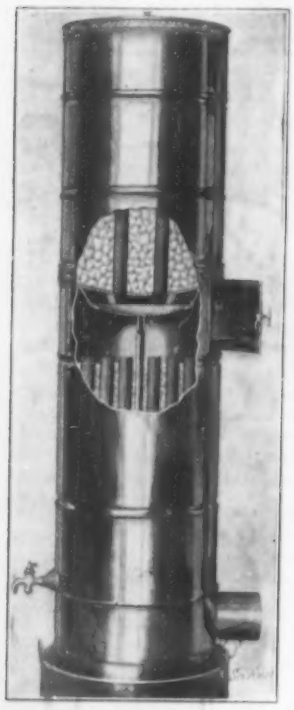
Messrs. Mueller and Kempf have discovered in the course of their photometric work at Potsdam a variable star of so short a period—about four hours—that it may fairly be called unique. Up to this time, the variables that went through a complete cycle of changes in the shortest time were two stars in the cluster *Omega Centauri*. These bodies complete their periods in 7 hours 11 minutes and in 7 hours 43 minutes respectively. *S. Antliæ* has a period of 7 hours 47 minutes. The Potsdam star has a period of about one-half as long. From minimum to maximum the light changes at a slower rate than from maximum to minimum. The magnitude varies from 8 6-10 to 7 9-10 and the length of the period is 4 hours 13 seconds. The hypothesis that best explains the observed phenomena is that two bright bodies are revolving at a small distance about a common center of gravity, the plane of revolution being nearly in the line of sight.

The Révue Scientifique gives a brief history of experiments on the segmentation of unfertilized eggs. In 1895 Hertwig exposed the eggs of the sea-urchin to a weak solution of sulphate of strychnine and obtained the phenomena of karyokinesis or segmentation. Then Morgan, in 1898, obtained the same result by simply increasing the osmotic pressure of seawater. Mead, in 1899, experimenting on another species, obtained a like result by adding chloride of potassium to the seawater. In 1899 Morgan suggested that the unfertilized egg was in a state of unstable equilibrium and that any one of several exciting causes was sufficient to break it up into a more stable state, i. e., to cause segmentation. That is, there is no specific excitement; the reaction alone is specific. Loeb, in 1899, obtained parthenogenesis experimentally by exposing the eggs of the sea-urchin for a very short time to a weak acid solution, or to an alkaline seawater. The presence of ether, chloroform or alcohol will determine the action also. The absence of certain chemical bodies may likewise determine segmentation. If seawater containing sea-urchin's eggs is deprived of its oxygen (the oxygen being replaced by hydrogen) then the eggs, when transferred to normal seawater, begin to divide. Temperature acts in a similar way. Eggs warmed to about 32 deg. C. begin to divide when replaced in seawater at an ordinary temperature. Abnormal lowering of temperature has been shown by Mr. Greeley to provoke the reaction. Mechanical agitation will do the same. Mr. Mathews points out that the foregoing results seem to show that the essence of the segmentation is the formation of localized zones of liquefaction in the protoplasm of the egg, thus suggesting an analogy with localized digestion.

In a very able *resumé* of the different methods by which the distance of the sun can be determined, and of the trustworthiness of the results, A. R. Hinks, M. A., before the British Association, warned against the proclamation of any "accepted" values, which were generally proved to be fallacious as soon as the agreement was proclaimed. There was no accepted value for the solar parallax until six years ago, when 8.80 was agreed upon. Greenwich meridian observations yield 8.802, most other methods lower values down to 8.762. The Venus transit observation, on which such strong hopes were built—while Leverrier, among others, was convinced that all the trouble was wasted—had failed; the minor planets had given excellent results; the aberration determinations at Pulkowa (near St. Petersburg) yield 8.793, Nyrén's own latest work there 8.782, other determinations elsewhere 8.806. The motion of the nodes of Venus, the secular variations of the four inner planets, and the dynamics of the mass of the earth had also afforded bases for calculations. But Eros, the peculiar planet whose orbit lies between those of earth and Mars, crossing the latter's orbit, was worth all the 480 planetoids. Eros was watched when nearest the earth in 1900 by fifty observers, and 8,000 protographic exposures were obtained. The analysis of the results will take years. Mr. Hinks himself is engaged in comparing the photographs taken at Cambridge with others, with the view of tracing errors. The distance of the sun is at present believed to be about 93,000,000 miles; we are uncertain about the hundred thousands. Prof. Turner mentioned that the twenty years' study of Jupiter's satellites at Harvard promised to give valuable results.

AIR-COOLING APPARATUS.

Prof. Willis L. Moore, Chief of the United States Weather Bureau, Washington, D. C., has invented an apparatus which is designed to moderate the extremes of summer heat just as a stove moderates the extremes of winter cold. This novel cooling stove, however, operates on principles which are the reverse of those of the heating stove. The fuel used is broken ice which is so disposed and mixed with salt as to create a draft through the apparatus in a downward instead of an upward direction. Referring to our engraving, it will be observed that the parts are inclosed in a cylinder of heat-conducting material. The interior is divided into two chambers by a diaphragm having openings at intervals along its edge. Cracked ice is placed in this upper chamber and woven-wire tubes conduct air through this ice and the diaphragm into the lower chamber. This is quite an important feature of the invention, for broken or granulated ice when melting has a tendency to cake into a solid mass, which eliminates interstitial spaces and precludes the proper diffusion of air through the mass and also retards and eventually wholly obstructs its flow. The woven-wire tubes always insure a passageway, and becoming imbedded in the ice serve to hold it up against gravitating into a cake at the bottom and allow lateral diffusion of air through the tubes into the interstices of the ice. The lower chamber of the apparatus is also filled with ice which, however, is more finely broken and is mixed with salt, which lowers its melting point greatly. The air circulation is completed to the bottom of the apparatus by a number of thin metal pipes projecting above the ice level. In order to prevent ice-water in the upper chamber from running along the bottom of the diaphragm and dripping into these pipes, a drip-pan is placed above them which catches this water and directs it to the waste pipe. Cold air is heavier than hot air, so that the natural tendency of the air at the top of the apparatus would be to fall down through the tubes, thus establishing a current which is further strengthened by making the lower chamber colder than the upper one. At the bottom of the device the cold air passes out into the room through the large tube shown at the right in our engraving. The cooling apparatus is provided with a trough at the bottom which is adapted to catch any water condensed from the atmosphere on coming in contact with the cold walls of the cylinder, from which it will be observed that the apparatus dries the air in the room. Furthermore, it purifies the air by absorbing in the ice and brine any particles of dirt or dust carried thereby.

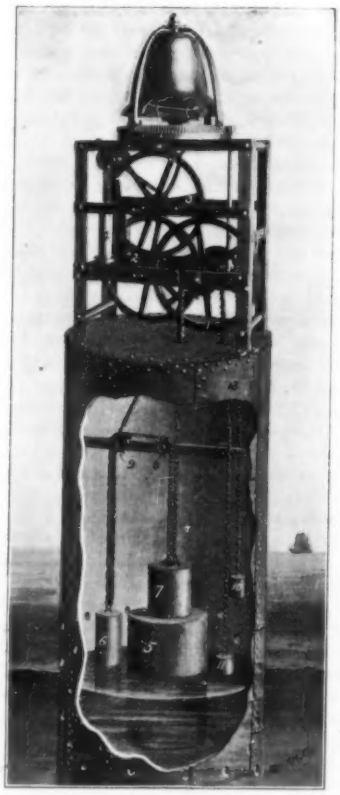


AIR-COOLING APPARATUS.

Big Ben, the celebrated clock of London, which regulates the time of a large portion of the British Empire, is having the dials on each of its four sides illuminated with 60-candle power Nernst lamps. The clock was formerly lighted by 24 gas jets on each dial, and on each night a man had to climb up and light these 96 jets. Two men spend three afternoons of each week winding it.

A BELL-BUOY OPERATED BY TIDE MOTOR.

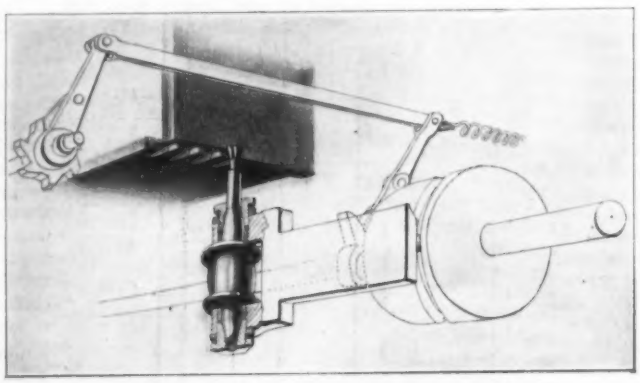
Ordinarily, bell-buoys are rung by the motion of the waves, which causes a steel ball to roll about on a plate under the mouth of the bell, and strike against its inner surface. With a view to making the action of the rolling ball positive, regular, and of a constant power, the Tidal Motor Power Company, of Seattle, provides a motor mechanism actuated by the rise and fall of the tide. The mechanism will be readily understood by reference to our illustration, in which the cylinder 13 is broken away to show the arrangement of the float and the weights. Connected to the gear wheel 1, by ratchet devices are two sprocket wheels. The chain connecting the weight 7 and weight 11 passes over one of these sprocket wheels, and over the other runs a chain connecting weight 6 and weight 10. The float 5 is connected to the weight 6 by a chain passing up through weight 7 and over the idlers 8 and 9. In our illustration, it is assumed that the tide is rising, and so the float is lifting weight 7, while weight 11 takes up the slack. The slack in the chain connecting the float with weight 6 permits the latter to drop slowly, rotating the gear wheel 1. The weight is so balanced as to move downward more slowly than the float moves upward, so that it will continue to operate the gear wheel at a constant rate while the tide is turning, and until the float begins to fall. Thereupon weight 7 continues the operation, while the float 5 falls and lifts weight 6, the slack being taken up by weight 10. The train of gearing 1, 2, 3, serves to greatly increase the speed of rotation imparted by the weights, and communicates the motion to a pair of plungers, working in the cylinder 4, and also to the cradle which carries the steel ball. The plungers govern the rocking of the cradle, so that the ball strikes the bell with a uniform stroke. The vertical rod shown at the right, in our illustration, is driven by bevel gearing on the driving shaft, and serves to slowly rotate the bell so as to prevent it from breaking under the constant hammering of the steel ball.



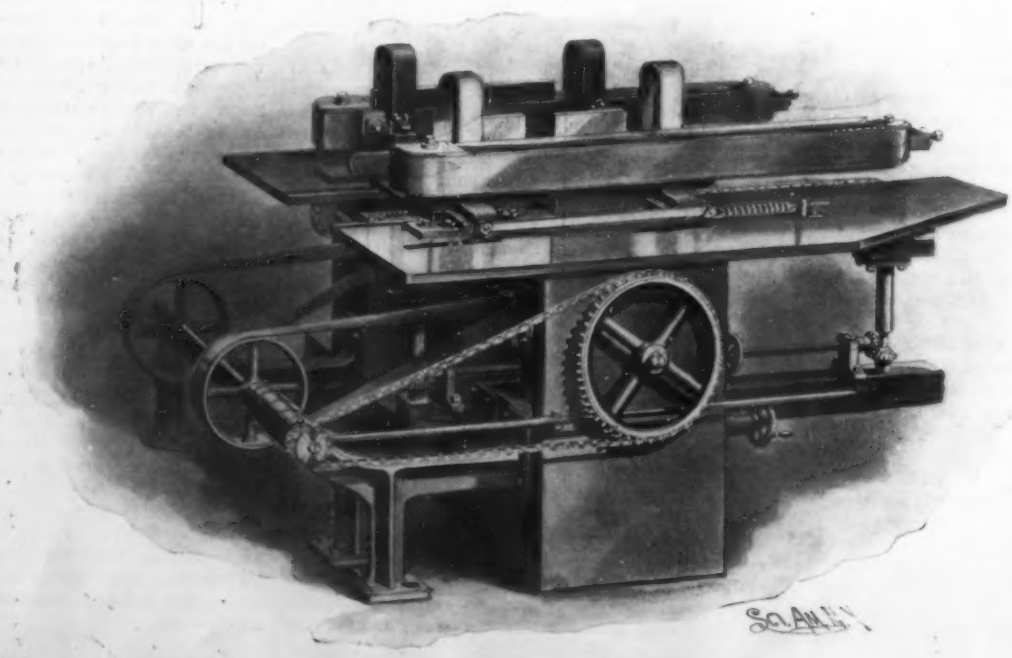
BELL-BUOY OPERATED BY THE TIDE.

DOVETAILING MACHINE.

An improved automatic dovetailing machine has recently been invented by Mr. J. T. T. Grim, of Cumberland, Md. The machine is self-feeding, it only being necessary for the operator to place the stock on the bed, so that the conveying chains may engage the same, and when power is applied the material will be moved properly relative to a rapidly-revolving cutter, and the mortises and tenons cut as desired without further attention on the part of the operator. The machine comprises two sets of mechanisms designed to operate on opposite ends of a bureau drawer or like piece of work. One set is mounted on a carriage which may be moved toward or away from the fixed mechanism to suit different sizes of work. The work is clamped, as shown in the general view, with the pieces in which the grooves are to be cut laid horizontal, while the others, on which the tenons are to be formed, are held in a vertical position. Two conveyor-chains are provided for each piece, and lugs bolted therein at proper locations serve to engage the pieces and feed them forward intermittently. The cutters, of suitable shape, are mounted in spindles which are rapidly rotated by belt connection with pulleys on the countershaft shown at the left of our engraving. The cutter spindles have bearings in brackets mounted to slide in guideways, to give the proper inward and outward movement of the cutters in forming the grooves and tenons. This movement is accomplished by means of a roller on each bracket, which is guided by an eccentrically-arranged cam-groove, as shown in our detail view. The cams are mounted on a shaft driven by sprocket and chain gearing from the counter-shaft. By means of a clutch connection on the counter-shaft, the rotation of the cam-shaft may be started or stopped at will. An intermittent or step-by-step motion is imparted by the cam-shaft to the conveyor-chains through the medium of a ratchet device, which is also shown in our detail view. It will be observed that a ratchet wheel is mounted on the conveyor-shaft, and is engaged by a pawl carried on a link

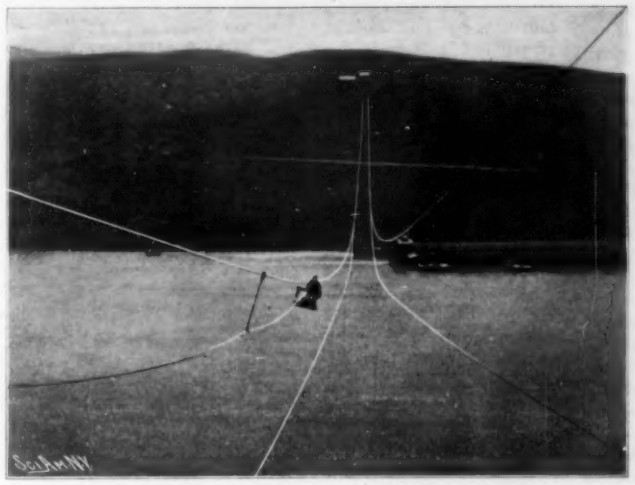


CAM-ACTION OF THE DOVETAILING MACHINE.



IMPROVED DOVETAILING MACHINE.

which is connected by a rod to a lever mounted above the cam-shaft. The lower end of this lever is provided with a roller, which engages a face-cam on the shaft. This cam is so shaped as to swing back the lower end of the lever when the drum-cams have drawn their respective cutters to the outer positions. This serves to push forward the link and pawl, turning the ratchet wheel on the conveyor-shaft; the conveyor-chains are all suitably connected with this shaft, so that the work on the beds will move forward in position for the next cut, while the cutters round the inner faces of the tenon that are being formed. After the projection on the cam has been cleared, the lever, together with its connections, is drawn back by the tension of a spring, and the pawl snaps behind the next tooth of the ratchet wheel, ready to move it forward another notch, when the cam projection again engages the lever. In the meantime the cutters are moved inward, each forming another tenon in its respective vertical piece and cutting grooves in the horizontal piece. Thus the work continues without requiring any attention on the part of the operator. When it is desired to dovetail an irregular piece of work, such as the swelled or curved front of a bureau drawer, it is necessary to support this front while the ends are being acted upon by the cutters. A central support and a supplemental conveyor-chain are therefore provided for the purpose. These are of course adjustable to different heights according to the shape of the work, and provision is made for moving them sidewise, also, in order that they may be properly positioned for work of different lengths. The machine embodies many improved details of construction which we cannot here describe, owing to the limits of space. One important construction will be observed in the mounting of the cutter spindles. It will be seen that they have tapered portions which fit in tapered bearings. The bearings may be screwed down to take up any play due to wear of the spindle. It is obvious that any size or shape of cutter may be secured in the spindle to meet the requirements of the work.



Greasing the Cables of the Colgate Power House.

LONG-DISTANCE HIGH-TENSION TRANSMISSION OF POWER IN CALIFORNIA.

BY HAMILTON WRIGHT.

In the vast developments of electric power and its transmission California is fast solving the problem of cheaper fuel and power. The remarkable development that has occurred in the long-distance high-tension transmission of power as well as the approximate magnitude of the transmission industry is directly traceable to the absence of coal in material quantities in this State and the corresponding high price of mechanical power. The great cost of steam power at the time of earliest efforts toward electric transmission was responsible for the turn of the California tide of engineering effort from the coal pile to the waterfall as the most promising source of energy whence to operate the rapidly-growing electrical industries of the Golden State.

Perhaps the most consequential and interesting phase of electric transmission engineering in California lies in the unification of remotely separated electric systems into a single unit of vast proportions. In other words, all the electric lighting, power and railway interests of all the cities of the central and northern portion of the State have been concentrated and centralized into a single system which receives power from sources enabling the cheapest generation. The development and perfection of extremely long-distance transmission lines has made such unification of interests possible, and the honors should perhaps be divided equally between the Standard Electric Company of California, with its 145-mile electric San Francisco transmission, and the Bay Counties Power Company, with its main-line transmission of 142 miles from the Colgate power house to Oakland. The Standard Electric Company was the first in the world to come out with a definite and matured project for the transmission of power of great quantity over a distance materially in excess of 100 miles. It built its electric power plant and sub-stations and finished its pole lines practically ready for operation, but unforeseen difficulties prevented the completion of its water system, so that the Bay Counties Power Company, although beginning operations at a considerably later time, finished its plant before the Standard plant and in so doing secured the honor of being the first enterprise to successfully undertake such a long transmission. More than this, the Bay Counties Company secured a temporary contract with the Standard Company by which the Bay Counties Company delivered current to the Standard lines at Oakland for transmission to Stockton, a distance of 211 miles from the power house at Colgate, and as far north on the peninsula of San Francisco as Burlingame, a distance of 218½ miles from Colgate. These are the longest systems of electric transmission in the world. Now both the Standard and the Bay Counties plants are in operation, and each over its own line.

The plan of centralization was the direct outgrowth of the success of extremely long-distance transmission. The Bay Counties Power Company's pole lines traverse that entire portion of California from Nevada County on the east to Butte County on the north, to Sonoma and Modoc counties on the west, and to Alameda County on the south, taking in each and every city, mining or other community consuming power *en route*. The electric lighting, electric power, electric railway and gas interests of this entire section are, almost without exception, under one transmission service for the operation of their electrical business, for all take power from the power houses under the control of the Bay Counties Power Company. In fact, this company operates in all more than 3,000 miles of transmission lines.

By means of its transmission lines the Standard Electric Company is tying together the electrical interests of the cities and towns extending around the Bay of San Francisco from Oakland to San Francisco. The Standard plant at Electra, in Amador County, has a capacity of 15,000 horse power, while that of the four generating stations of the Bay Counties Power Company, located in Yuba, Nevada, and Butte counties, is close to 23,000 horse power. In addition to these outputs the Standard Company is now building a new 21,000 horse power station in Stanislaus County and the Bay Counties Company is building an 8,000 horse power station in Butte.

However, these two great systems, which fairly cobweb the central portion of the State from east to west, by no means comprise a major portion of the electric long-distance transmission plants in California.

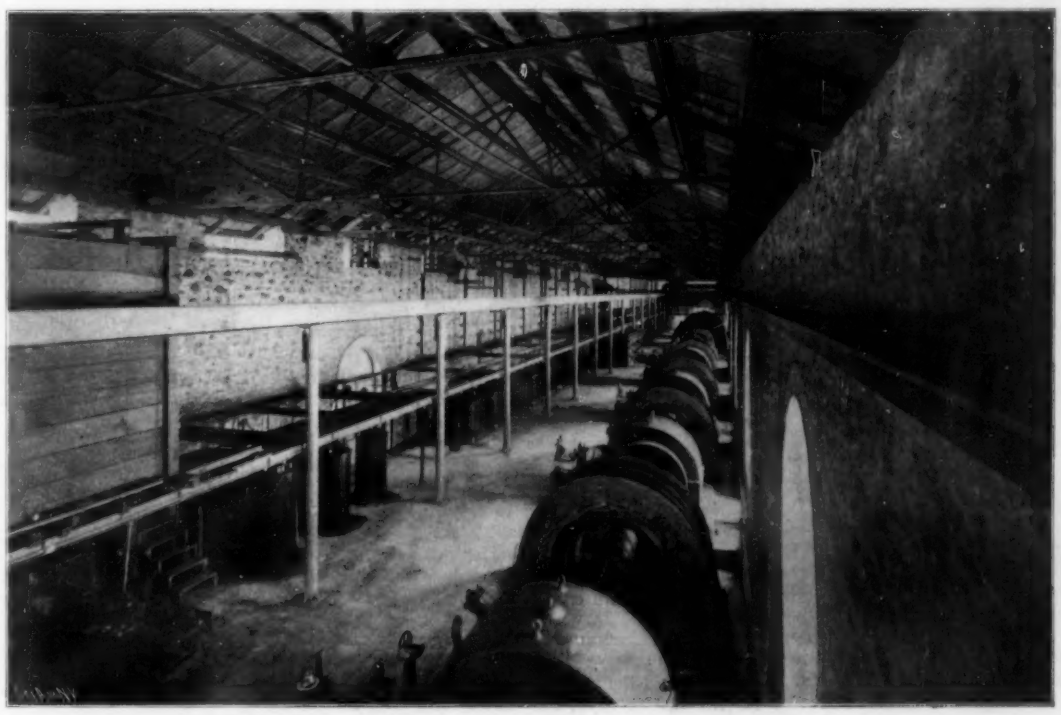
In the northern California system are the Butte County Electric Power Company, supplying Chico and the gold dredgers of that region and traveling with 23,000 volts thirty miles, and the Keswick Electric Power Company, which supplies power from Shasta to Redding and the Mountain Copper Company.

Electricity in mining is proving of immense value, especially for gold and silver mining in the desert regions where water is precious and fuel is costlier than almost anywhere else in the United States. With electricity, shafts, tunnels, leads, and slopes may be illuminated, drills may be run, elevator hoists lifted, fans will keep out impure air and pumps will keep the mine dry, while dynamite blasting may be conducted with less than half the present dangers.

The famous Yellow Aster Mining Company, at Randsburg, has gone to great expenditure in demonstrating the uses of electricity in working mines and has recently contracted to buy 3,500 horse power from a power company which is developing 8,000 horse power for mining purposes. Very recently a company with $1,500,000 paid-up capital has been organized for utilizing the power in five great streams along the Sierras. A corps of engineers who have been making plans for the development of electric power from the Kaweah River in Tulare County put the total expense of the work at $9,000,000. About 9,000 horse power will be obtained and this may be utilized in Tulare, Porterville, and other San Joaquin Valley towns. The San Joaquin Valley Company has recently finished harnessing a stream in the Sierras and is now transmitting several thousand horse power to Fresno and Hanford, over foothills and across rivers, ranches, orchards, and vineyards, for a distance of thirty-two miles. This is the cheapest power in the world and is furnished at as low a rate as two cents per horse power per hour.

Probably the most remarkable use to which electric power has been put is to move the implements of agriculture. At this writing a number of big grain raisers in San Joaquin Valley, California, are closing a successful series of experiments by which a combined harvester is impelled by electric power. Thus the stream which has furnished the wheat fields with water for irrigation purposes, also gives the power by which the crop may be later harvested.

The world's first successful experiment in electrical transmission was made in Germany in 1891. From Lauffen a line of 108 miles was run into Frankfort to light an exposition held there in that year. It worked successfully. Within a year the first electrical power plant in which the specific gravity of water was used in the United States was begun at Pomona,



The Latest View of the Interior of the Colgate Power House.

Cal. This was followed by the opening of the big plant at Folsom, Cal., which at that time was the largest in the world. The first current that flashed along its wires carried 400 horse power 21 miles at a voltage of 11,000. Years were spent in the work at Folsom. An immense masonry dam 650 feet long, 24 feet wide at the crest, 87 feet wide at the bottom, and 89 feet high at the highest point had been thrown across the American River. The dam contains 50,000 cubic yards of granite and creates a reservoir three miles long. At either end are massive head gates to contract the passage of the water into canals, which give a flow of 85,000 cubic feet a minute. The water supply is sufficient for the irrigation of 300,000 acres of land, including large areas on both sides of the American River. The work on the Folsom plant five years ago was only second to that at Niagara Falls, and the great plant already furnished 45,000 horse power, transmitted a distance of 24 miles to Sacramento for use by street car lines, electric lighting companies, and in factories and machine shops. The success of this great plant was only made possible by the fact that the year after it started a dynamo was invented which made electric power available for manufacturing purposes. The first plants could employ their currents for lighting and for the propulsion of street cars alone, but here was a new application which made the patronage and the profits of the concerns doubly sure. The demand for electric power and the field for its operations in California are proved by the alacrity with which it has been caught up by consumers all along the power lines. All plants are running full power, with the whole current in use and more in demand. Very lately the large Folsom plant was found inadequate to supply Sacramento with a sufficient current and additional power was obtained from Colgate. All electric power companies strive for a business so regular that it will take a full supply all the time, for a full line will furnish just so many horse power a day and it costs as much to maintain a line whether it is supplying a full current or half its possible current. In industries which call for a regular supply of power, electricity has largely supplanted steam in San Francisco.

At the present time the power of the mountain cascades is being rapidly harnessed and a new industrial era has sprung up upon the Pacific coast. There are now twenty electric power plants upon the Pacific coast, and of those yet unmentioned is that now in process of construction at Redding in northern California, at the base of Mount Shasta. New York, San Francisco, and Buffalo capital is back of this enterprise to the extent of $6,000,000, and when completed it will be the greatest electrical power plant in America outside of Niagara. Another large plant which when completed will hold the world's record for long-distance transmission is being constructed upon the Kern River, 27 miles from Bakersfield, Cal. A corps of engineers and a gang of laborers are hard at work. Then, too, there are the big Yuba County power plants and that of the Mount Whitney Power Company. There is a big plant at Truckee, Cal., which sends 1,500 horse power to the Comstock mines, the great mines which made millions for the Stewarts, Mackays, Flood, and Fair families and which are still paying dividends. The Blue Lake Water Company is another important plant. The South Yuba Water Company, in which Senator C. N. Felton and Dr. Charles Van Norden, of New York, are largely interested, will develop a 30,000 horse power plant. The company controls a number of large storage reservoirs and twenty large lakes in Placer and Nevada counties, California. They now have 400 miles of flumes and a storage capacity of five billions of cubic feet. They now furnish 5,000 horse power to the small cities and mines in that district.

In utilizing the power of mountain streams to run street cars, ship yards, mines, canning factories, gold dredgers, to illuminate, to propel machinery, and even to heat buildings in far-away cities, the value of the streams is not diminished, for most of the water upon issuing from the turbine is re-diverted for the purpose of irrigation. In fact the use of water for power does not consume one drop of the fluid, but employs only the energy furnished by its fall. Thus the two go hand-in-hand, and wherever the resources for irrigation are tapped, a double return for the capital employed may be obtained through the installation of electric power plants.

Altogether, 140,000 horse power has been converted into electrical energy in California. It is conservatively estimated that the waterfalls alone have close to 300,000 horse power, exclusive of that which will arise in the building of dams in torrential streams. There are now in the neighborhood of $10,000,000 invested in these plants, and several thousand men are at present engaged in as many as a dozen different projects to convert the vast, almost inexhaustible power of the flowing streams into a force that shall be commercially valuable.

Correspondence.

A Jointed Snake.

To the Editor of the SCIENTIFIC AMERICAN:

Being a reader of your paper, of course I notice the snake stories; and having been raised on a farm in Missouri, while a boy killed many rattlesnakes, also other kinds, among them what was known to me as the joint-snake, that by striking would fall into sections about one and one-half inches in length; and the head end, about four inches long, would run away and hide until it thought the enemy had gone, then return and gather itself up, and be as good as new. In discussing snakes with a friend, born and raised in New York, now living in Ohio, I was unable to convince him that there was such a thing as a joint-snake. Since the statement that I have made is strongly disputed, it is but natural that I should be anxious to find an authority for my statement regarding the present or past existence of the joint-snake in the United States. Will you look the matter up, and give it a little space in your next issue?

NORMAN S. DONNELLY.

[Our correspondent refers to a creature which has puzzled many an observer and given rise to as many stories as the "milk-snake" and the "toad in the solid rock." It is fair to say that a large percentage of the farmers of the country believe that there is a "jointed" or "glass snake," which can disjoint itself and break up, to come together later; and it is difficult to find a boy brought up in the country who will not testify that he has seen the miracle time and again; and the most interesting feature is that they all firmly believe it. To give the deluded ones credit, the actions of the "jointed snake" are so remarkable, so extremely unconventional, that there is little wonder that the sharpest observer is deceived; but there is a vast difference between what one really sees and what one thinks he sees, and herein lies the mystery of the "jointed snake."

To start fairly, there is no animal known to science as a jointed snake. What the credulous observer believes to be such is a lizard known scientifically as *Opheosaurus ventralis;* a well-known low form common east of the Mississippi River and south of the Ohio River. That it is considered a snake is hardly to be wondered at, as it has no feet; and when alarmed, darts away with the peculiar gliding or wriggling motion of a snake, and to any one but a naturalist it would, doubtless, be considered a snake. But the animal is a lizard, and the long cylindrical tail, *twice as long as the body*, to the untrained observer appears to be the body. This slender tail is the cause of the many fables prevalent regarding the marvelous powers of the "glass-snake," which is so brittle that it cannot be touched without breaking; but the fact is that the vertebræ, or bones of this long tail, are so delicately adjusted or connected that it is almost impossible to lift the animal by it without breaking it. Any violent jerk or strain will throw the tail into one or more pieces, which lie on the ground wriggling with a convulsive movement, while the head and body crawl away. In a word, it is not the body of the lizard, but its long tail which breaks up—a very common trick among lizards. The tail thus thrown off is deserted, the lizard having no more power to reattach it than has a man to assume his amputated leg. But the lizard has this advantage: a new tail begins to grow at once, and the glass-snake is in a short time itself again, and may break up and be renewed an indefinite number of times, so far as known. In a collection of lizards caught at random in the San Gabriel Valley, Southern California, fifty per cent had new tails in all stages of growth from one to four inches in length, being darker and readily recognized as new and growing tails. This faculty of reproducing lost parts or limbs is common among crustaceans, and the casting of tails is so deftly carried out among lizards that the conclusion is irresistible that it is intended to deceive the pursuer or enemy. Another "glass-snake" is the lizard of the genus *Anguis*. The "blind worm" often throws off its tail at the slightest danger, and it is almost impossible to catch and retain one without the loss of this member.—ED.]

The New English Torpedo Boats.

The first of the new type of torpedo boat destroyers, for the British navy, the "Erne," has been launched from the yards of the Palmer Shipbuilding Company, of Jarrow-on-Tyne. This improved class has been rendered necessary by the loss of the "Cobra," and the buckling in heavy seas of other vessels, consequent on too light construction of the hull. In the "Erne" class, a forecastle is provided in lieu of the turtleback deck, thereby providing a much higher bow for driving against a rough sea. The structural length of the hull has also been increased, whereby a considerable addition to the displacement is made above that of the 30-knot type boat. As a matter of fact, speed has not been sought after so much as strength in the "Erne," for the maximum speed is only 25½ knots under the usual loading conditions. In this vessel somewhat of a reversion is made as regards speed to the first type of torpedo-boat destroyers, the speed of which was 27 knots. In subsequent vessels a speed of 30 knots was attained, but only by the sacrifice of structural strength. The dimensions of the "Erne" are: length, 222 feet; beam, 23 feet 6 inches; and 7,000 I. H. P. The armament, however, is the same as that of the 30-knot boats, comprising one 12-pounder, mounted on the conning tower forward, and five 6-pounders, four of these being on the broadside and one on the raised central platform aft, and two 18-inch torpedo tubes. With regard to the armament of future destroyers, the Admiralty has made an important alteration. Boats of 27-knots speed are to carry only one instead of two torpedo tubes, while the first-class torpedo boats will be fitted only with a view to enable this type of vessel to move with greater celerity in night attacks. The "Erne" is to carry a crew of 70 officers and men. The machinery consists of twin-screw triple-expansion engines, steam being supplied by four of Reed's water-tube boilers.

The Historical Novel and Its Value in Trees.

The flood of novels which has incessantly poured in upon us of late years, more than ever emphasizes the truism that of the making of books there is no end. A decade ago it was the so-called "psychological novel" that enthralled us; now it is the judiciously advertised historical novel that holds our rapt attention. Through the ingenious refinements of modern advertising the sales of fiction have been increased so prodigiously that a novel can hardly be called a "success" unless it has been sold to the extent of a hundred thousand copies.

The newspaper tales of the enormous editions of historical novels are by no means as fantastic as they may read. A list, carefully compiled from publishers' returns which are absolutely without reproach, shows that the sales of nine recently published novels have reached astounding proportions. Of one book, over 400,000 copies have been sold. Another is in its 325 thousand. Less successful books have attained only a paltry sale of 100,000, while a few minor ones hardly exceed a disappointing 80,000.

It is not our purpose to dilate upon the relative merits of these volumes of fiction, but simply to show what it costs to satisfy the public appetite for tales of wild adventure.

Books are made of paper. Paper in turn is made of cellulose, of which the chief source of supply is timber. In order to describe the romantic career of a seventeenth century gentleman of the rapier, it is necessary to fell a few hundred trees; the publication of many narratives in which the exploits of other cavaliers are dwelt on, may therefore entail the destruction of a forest.

The nine novels to which we have referred had a total sale of over 1,600,000 copies. Since the average weight of each book sold was probably twenty ounces, a little calculation will prove that these 1,600,000 books contained approximately 2,000,000 pounds of paper. We are assured by a manufacturer of paper that the average spruce tree yields a little less than half a cord of wood, which is equivalent to about 500 pounds of paper. In other words, these nine novels swept away 4,000 trees, and they form but a small part of the fiction so eagerly read by the American public. Some books are worth more than 4,000 trees. What may be the tree-value of the modern historical novel it is not within our province to decide.

A National Club House for Engineers.

Through the munificence of Andrew Carnegie, who has agreed to give financial aid to the extent of one million dollars or more, a national club house for engineers may be erected in the city of New York. The building proposed will occupy a plot extending from 39th to 40th Streets, between Fifth and Sixth avenues, upon a small portion of which the Engineers' Club of New York now stands. According to the present plans, the Engineers' Club will occupy one portion, and the remainder will be used by the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Society of Electrical Engineers, and the American Society of Mining Engineers provided the separate organizations decide to take advantage of Mr. Carnegie's offer.

More News About Nova Geminorum.

The light of Nova Geminorum appears to be fluctuating like that of Nova Persei No. 2. On the evening of May 1 it appeared that its light had increased about half a magnitude during the preceding twenty-four hours. Since the measures described in the Bulletin of April 22, similar measures were obtained on April 24, 25, 27, 28, 29, 30 and May 1, and gave the magnitudes 9.37, 9.67, 9.71, 9.81, 9.61, 9.76, and 9.26 respectively.

EDWARD C. PICKERING.

Harvard College Observatory.

Engineering Notes.

The Russian navy has been augmented by a useful vessel, the "Ocean," which is to be utilized entirely for the training of engineers and firemen for water tube boilers, so that they may become acquainted with the peculiarities and characteristics of the various types of boilers of this class. This particular vessel is equipped with four distinct designs of water tube boilers—the Belleville, Schulze, Yarrow, and Niclausse. The vessel will be supplied with 4,000 tons of coal, and will carry a class of 400 men. She will then sail for the East, the men being instructed during the passage, so that by the time the "Ocean" reaches Chinese waters, the men will be sufficiently competent to be transferred to the various warships of the Russian squadron operating in those waters.

The Russian government has completed the first stage of the construction of the southern section of the railroad to Turkestan between Orenburg and Tashkend. About two-thirds of the length of the embankment have been carried out and only 25 miles of the first section await the finishing touches. Four thousand artisans have been employed upon the work. The stonework of the first two sections is nearly finished, and temporary bridges have been built over the rivers Salar and Keles, as the permanent bridges have not yet been constructed. The telephone poles have been erected as far as Turkestan, and telephone stations established. Further on the telephone wires have been attached to the telegraph poles already in use as far as Perovsk. Depots for materials and dwellings for the persons employed on the line have been established along the five sections and at the bridge of Tchinaga. There are also temporary workshops for the repair of the rolling stock including the locomotives.

An overhead railroad of the Elberfeld (Germany) suspension type is projected for London by a syndicate of German, American, and English financiers and engineers, and the necessary Parliamentary sanction is to be sought for this session. It is proposed to construct the railroad above the River Thames, as with the river Wupper in Germany, though owing to the greater width of the Thames the railroad will be constructed upon the southern shore. The line is to stretch from the city to the southern western suburb Barnes, and is to follow the course of the river throughout its entire length, approximately eight miles. The plan of construction will be similar to that over the Wupper, the rising angular lattice girder supports being fixed to concrete foundations sunk into the river bed. It is contemplated to erect fourteen stations. Electricity will be the motive power, and it is proposed to cover the complete journey, including stoppages at each of the intermediate stations, in 23 minutes. The railroad would be raised to a sufficient height to cross above the bridges, at each of which the stations would be built as far as possible, access being obtained to the stations therefrom by means of lifts. It is proposed to erect the girders supporting the track at intervals of 200 feet. Only one class of carriage would be provided, and a uniform fare of four cents would be charged for any distance. It is estimated that the cost of the project will be about $25,000,000 and it will occupy five years to complete.

A series of experiments have been carried out upon the railroad between Chateau de Loir, in the Sarthe, and Chateau-la-Villiere, in Indre et Loire, France, with a new system for the prevention of collisions between railroad trains traveling in opposite directions upon the same track. This system is the invention of a Spanish engineer, Señor Basanta. When a train is either stationary or in motion upon a certain track, and another train is approaching upon the same track, information of the fact can be transmitted between the two trains by an electric current, which rings an electric bell upon the engines. This alarm given, the engineers of the two trains can establish telephonic communication and thereby avert a collision. In the cab of each engine is fitted a telephone and alarm bell, and along the rail of the track a wire is placed. Connection between this rail wire and the engine telephone is obtained by a sliding shoe, while a second wire called a conductor of protection extends between the disks and the stations, for the purpose of affording communication between the train and the station immediately behind or in front, whichever the case may be, where telephonic posts are provided for such communication with the train. To one axle of the train a dynamo is attached, and the train must be traveling at a speed of at least six miles an hour to exert sufficient current to actuate the signaling arrangements. When the train is stationary a magneto machine operated by hand is utilized. The invention works somewhat upon the block system, the bell automatically ringing when two trains are in the same block. The contrivance was severely tested upon the French railroad, and is to be subjected to further experiments with a view to simplifying the mechanism and working arrangements of the device.

Electrical Notes.

The Western Union Telegraph Company has begun the work of stringing new No. 11 copper wire on its poles between New York and Montreal. The work was commenced at Albany, and continued to Whitehall, at which point it was taken up by the Great Northwestern Telegraph Company, and will proceed at the rate of nearly eight miles a day to the Canadian capital. The section between New York and Albany will be completed at an early date, and it is expected to have the entire work finished by the end of the winter. The distance from New York to Montreal is 400 miles.

In order to familiarize the people with the domestic uses of electricity, and at the same time increase the demand for the current, a Chicago electric company has adopted the idea of using small cottages of a portable nature and erected at different points through the city for short periods of time. The cottage is brilliantly illuminated outside and in, for the purpose of attracting attention at night, and the interior is fitted with all the devices which can be operated by electricity that are designed for use around the home. There are about seventy-five different electrical contrivances of this nature, including fans, sewing machine motors, cooking and toilet utensils, and all the different kinds of lamps which are available for home use. Visitors are allowed the greatest freedom, and even encouraged to handle the things on view and ask questions about their use. It is said that about 125 persons visit the cottage on an average each day.

What may be paraphrased as "wordless telegraphy" is to be the next development in practical telegraphy. We get the first intimation of this from the introductory remarks to a code book, just published, entitled "Pantelegraphy, Section PAPE," by A. C. Baronio, which is in point of fact a commercial skeleton code of 273 pages, framed on entirely different lines from what has been the practice hitherto. The author claims that it has cost him many years of study and labor in order to bring his invention to the present practical shape and simplicity; and the originality of the system (for Section PAPE is but a part of a complete telegraphable system of short-hand) briefly stated, consists in reducing the present Morse alphabet to only ten short characters or sounds, which are so manipulated by a key as to express anything and everything by them in such a way as to give the public greater privileges while at the same time immensely reducing the work of the telegraph operator, even assuming that no alteration is made in the instruments of today. A set of automatic instruments is now being perfected, it is claimed, which will render pantelegraphic messages so cheap that most of the important communications that have to be sent by mail now, on account of the almost prohibitive rates under present conditions, may be telegraphed in future.

An electric tramway is to connect the Naples traction system with the small incline which is located on the slope of Vesuvius. This will be of great convenience to tourists, as at present they are obliged to climb part way up the mountain in carriages or on horseback. The small incline was installed some time ago by Cook & Co. and passes from a point half way up the mountain to the summit. The new traction line is to start from the outskirts of the city and ascend by an easy grade to the Observatory, then reaching the lower station of the incline. The line will have a total length of 4½ miles. Over a length of some miles on the mountain slope, where the grade reaches 25 per cent, the rack-and-pinion system will be used to secure adherence. The rest of the route has grades of only 8 per cent. The generating station will be placed at the foot of the rack-and-pinion section. It will contain two gas engines of 90 horse power each, which will drive two direct-current dynamos working at a voltage of 550 to 770. A storage battery will be provided as an accessory to the dynamos. The cars are to hold twenty-four passengers seated and six standing. A locomotive of special construction will draw the trains. The latter will start eventually at 17-minute intervals, but at first a 35-minute interval will be used. The electric installation, including the central station rolling stock and line, will be carried out by Brown, Boveri & Co., the well-known Swiss firm. The gas engines and mechanical part of the locomotives will be constructed by the Winterthur Locomotive Works. Another new traction system is that which will soon be constructed for the city of Leghorn, it having decided to adopt the electric system in the city and also on the interurban line to Montenero. The power station is to have three steam engines, each of which drives a direct-current dynamo of 400 amperes and 600 volts. The trolley system will be used throughout, with motor cars of 25 horse power for the city lines. On the interurban line where the grades are heavy, the motor cars are more powerful and will contain two 30-horse power Schuckert motors; in this case the trolley line is double. The central station is capable of supplying 500 horse power.

Gasket and Insulation Troubles in Gas Engines.

BY A. E. POTTER.

Many manufacturers of gas and gasoline engines experience considerable difficulty from gaskets and insulation blowing out. I have seen cases where it seemed absolutely impossible to make and keep joints tight, and in every case of this kind I have found serious unevenness of surface, which had to be remedied by scraping to a surface plate, or planing off the top end of the cylinder and refacing the cylinder head.

In casting about for the reasons existing for such marked unevenness, I have decided that there are usually two primary causes. The first and principal one is that the traveling facing tool, when cutting in line with the parting of the spindle bearings of the lathe, gives way slightly from a little side play, and leaves two high ridges at diametrically opposite points. The further from the center the cut is made, the more spring there is to the tool, which accounts for the tendency to a "dishing" finish. The other cause is the distorting of the cylinder by the clamps that hold it rigid to the lathe carriage, when it is being bored and faced. The open or head end would be squeezed out of shape more easily than the lower, or crank case end, and as soon as the pressure of the clamps was relieved, it would return to its original shape. If, however, the cylinder head, not water-jacketed, were to be perfectly flat and planed off, instead of faced on a lathe, it might be possible to draw the two surfaces sufficiently close together to hold the gasket. But where a one-quarter inch to one-half inch shoulder is left projecting down below the edge of the top of the cylinder, into the latter, it prevents the head springing to conform to the inequalities of the cylinder top, and if the head has been finished on the same lathe as the cylinder, there are liable to be two ridges on it also, whereby the difficulty is doubled. I think it would pay in the end to plane off both surfaces when this is possible; and if two thicknesses of one-sixty-fourth inch asbestos paper soaked in boiled linseed oil, dusted with fine graphite, are used for a gasket, followed down when the engine gets heated up, with care, it will be found that one gasket will allow the head to be removed many times without the necessity of cutting a new one every time. I prefer to use the one-sixty-fourth inch rather than one-thirty-second inch thick, for there is less liability of the thinner paper running uneven in thickness.

A serious defect in igniter insulation and construction can also be remedied very easily and cheaply. Drill a one-half inch hole through a brass plug made one-half inch longer than usual, with a hexagonal lock nut to fit it. Through this pass a seven-sixteenths inch stud with a lock nut and washer at each end, with room at the top for a binding nut. Between the washer and ends of the plug put mica washers, and around the stud wrap flexible mica, or tubing made of the same material, and screw lock nuts up tightly. In adjusting the firing pin, loosen the lock nut outside, and screw the brass plug itself, instead of loosening the firing pin. It will be found that mica insulation secured by this means will never blow out, and will last and give good results indefinitely, and tightening up the wire connections on top of the firing pin will not disturb the insulation. The hotter the brass bushing or plug gets, owing to greater expansion than the pin, the tighter it will be.

Magnetic Rotation in a Variable Electromagnetic Field.

Another case of magnetic rotation in a variable electromagnetic field has lately been recorded by N. Orlow before the Russian Physico-Chemical Society. In investigating the mechanical effects of a variable magnetic field, the author happened to observe that a small iron cylinder, placed horizontally within a copper solenoid, would start rotating about its axis when the solenoid was placed beside the pole-pieces of the core of an electromagnet traversed by an alternating current. The same phenomenon was observed when the solenoid was replaced by a horizontal tube of any material. A possible explanation is suggested by the fact that the iron cylinder will tend toward the points of the field, where the force is highest, and some similar cases are recorded.

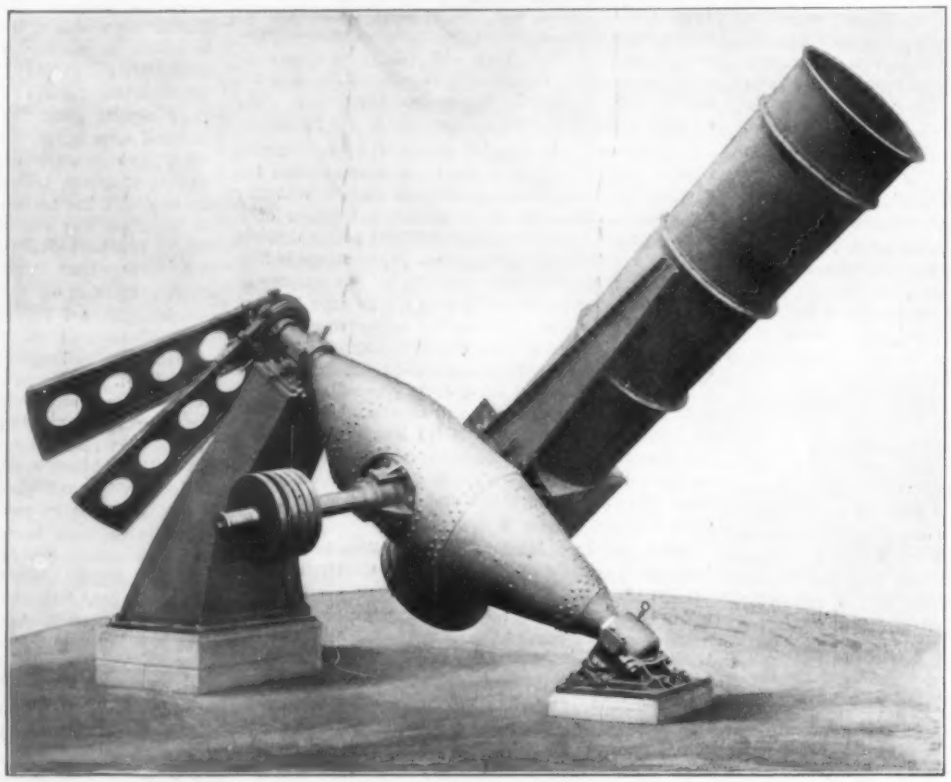
Trials of the Lebaudy and Santos-Dumont Airships.

The dirigible balloon of the Lebaudy brothers started from Moissons on May 8, in cloudy weather and with a northerly wind, for Mantes. There the airship made several circles around the tower of St. Maclou and the church of Notre Dame, and then returned to Moissons against the wind. M. Juchmes, who piloted the balloon, and M. Rey, the machinist, say they covered the distance of 37 kilometers in one hour and thirty-six minutes. The highest altitude reached by the airship was 300 meters.

M. Santos-Dumont made his first trial of the steerable balloon "Santos-Dumont No. 9" on May 7. He declared himself as being perfectly satisfied with the test.

THE CROSSLEY REFLECTING TELESCOPE AND ITS NEW MOUNTING.

The new mounting for the Crossley reflecting telescope, presented in 1895 to the Lick Observatory by Mr. Edward Crossley, of Halifax, England, has been completed. The telescope, which has a 3-foot aperture and a focal length of 17 feet, 6 inches, was built about 1888 for the private observatory of Dr. A. A. Common, a wealthy English amateur astronomer, for the purpose of proving his theory of the construction of large reflectors and their mountings. Later the instrument was acquired by Mr. Crossley and set up in his private observatory. Recognizing the injurious effect which the climate of England would sooner or later have upon the telescope, and the great climatic advantages of the location of Lick Observatory, Mr. Crossley presented the telescope and its dome to that institution.



THE CROSSLEY REFLECTING TELESCOPE.

It was with the Crossley reflector that Dr. Keeler, in 1898-1900, did so much successful photographic work. The instrument is of peculiar interest, marking as it does the beginning of a new period in the use of a much-neglected form of telescope. The original Crossley mounting was unsuited for long photographic exposures by reason of flexure and other defects. A new and more stable mounting of the equatorial form was therefore devised by Harron, Rickard, & McCune, of San Francisco. The steel tube carrying the mirror and plate holder is attached to a heavy steel declination axis, passing through the middle of a long polar axis, which is supported at both ends. The polar axis is adjusted exactly parallel with the axis of the earth, so that by rotating the telescope on the polar axis at the speed of the earth's rotation and in the opposite direction, a celestial object will apparently remain stationary and can be photographed by exposing a plate for a long time. Since the bearings for the polar axis are on separate piers, some means were necessary for their ready adjustment. For that reason the surfaces on which the bearings rest have been made cylindrical in a direction at right angles to the polar axis. The bearing-plates can be adjusted in altitude and azimuth.

A leaning pier, 8 feet high, supports the north end of the polar axis, which pier is built up of heavy steel plates riveted to castings at the top and bottom and strengthened by two angle iron frames in the interior. The steel pier will in turn be supported by a brick and concrete foundation 6 feet high. The south bearing plate will rest directly on a brick and concrete foundation.

The polar axis is 14 feet long, in order to permit the lower end of the tube of the telescope to move freely under it in all positions.

The tube of the telescope consists of a strong cubical section, which is attached directly to the declination axis, and of five circular sections. Below the cubical section is a circular section of heavy sheet steel, to which is attached a cast-iron cell holding the mirror. The upper sections of the tube are of light sheet steel bolted to steel flanges. The last section is short and can be rotated about the axis of the tube. In the center of this end section the apparatus for holding the photographic plate and for guiding during the exposure is held by four webs of steel.

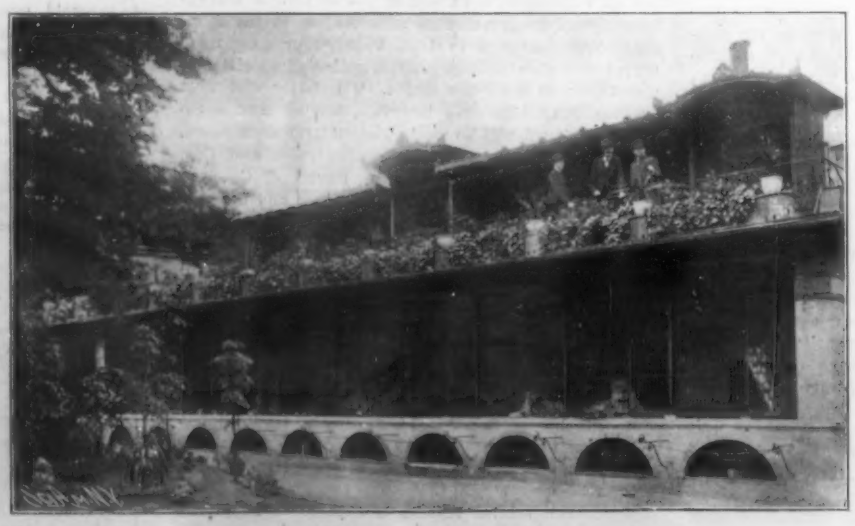
In this reflecting telescope, as in all reflecting telescopes, the light from the star passes down through the tube to a concave mirror placed at its lower end, in the focus of which mirror an image of the object is formed. The focus of the Crossley reflector is 17 feet, 6 inches from the mirror. For the sake of convenience, a diagonal flat mirror is usually inserted in the cone of light before it comes to a focus, so that the light is reflected at right angles and an image formed just outside of the main tube of the telescope. The introduction of this diagonal mirror causes a loss of light, in order to obviate which, in the mounting of the Crossley telescope, the photographs will be taken in the principal optical axis.

No matter how accurate the driving mechanism of a telescope may be, it is impossible to keep exact pace with the apparent motion of the star toward which it is directed. Hence an auxiliary telescope is attached rigidly to the plate-holder to serve as a guiding-telescope. This guiding-telescope is provided with a pair of fine cross wires. During the time in which a photograph is being taken, the image of a star is kept at the intersection of these cross wires. If the star image moves from the intersection of these wires, it is brought back by means of two screws, which screws also control the plate-holder. The plate-holder and cross wires will be moved by rods which extend in from the side of the telescope.

The driving mechanism of the telescope is a clock train of the conical pendulum type, which drives two sectors of 8 feet radius, attached to the north end of the polar axis. A single sector will run the telescope for an hour. During this time the idle sector will be reversing, ready to be set in gear to run the telescope as soon as the first sector has run down. The thrust of the polar axis is taken directly on a ring of hardened steel balls at the lower end, the greater portion of the weight failing on counterbalanced rolls. The telescope tube with the mirror and the various attached apparatus are counterbalanced by adjustable weights on the opposite end of the declination axis.

J. M. B.

Herd of Yak in Northern Thibet.



Animal Cages at Hagenbeck's.

THE TRADE IN WILD ANIMALS.

THE TRADE IN WILD ANIMALS.

BY HAROLD J. SHEPSTONE.

Hamburg is by far the principal depot for the shipment of wild beasts. Nearly the whole of the trade here is in the hands of one man, Mr. Carl Hagenbeck. Some idea of the immense amount of business done by this well-known dealer is evidenced when it is stated that in the course of a single twelvemonth he dispatched from Hamburg some 76 lions, tigers, and panthers, 42 different sorts of bears, 52 elephants, 64 camels and dromedaries and some 730 monkeys, besides a large number of other animals and birds. The greater portion of this vast collection is sent to America to the various towns and is purchased by directors of zoological gardens and by circuses.

During the week the writer was in Hamburg Mr. Hagenbeck shipped $2,500 worth of animals to Cincinnati and $3,500 worth to Philadelphia. He was also busy preparing a large consignment for the New York Zoological Society. When Prof. Hornaday, the Director of Bronx Park, visited Europe in the autumn of 1902 he spent $17,000 among the European dealers in the purchase of animals. He bought 6 lions, 2 tigers, a leopard, jaguar, cheetah, 2 black leopards, mountain goats and sheep, a chimpanzee, an ibex, a wild hog, a number of snakes and a lot of large and small birds. When I mentioned this to Mr. Hagenbeck he admitted the fact that there is a growing interest in zoos and that in a few years' time the United States will boast of some magnificent gardens. He also told me that his thirty-six years' experience as an animal dealer had taught him that the three great nations

that possess a natural inborn love for animals and desire to know all about them are the Americans, the English, and the Germans.

The great worry of the big dealers is to keep their stock up-to-date. At the time of my visit to Hamburg Mr. Hagenbeck told me he was daily expecting some of his travelers from Siberia with a herd of 30 roe-deer, 15 ibex, wild sheep and several smaller animals and birds. One man was also bringing home 3 giraffes from Soudan, as well as some Kudu and other antelopes. In a week's time he was expecting a shipment from German East Africa, which included 20 zebras, 2 African rhinoceroses, some white-bearded gnus, water buck and other antelopes and a number of smaller animals and birds. From West Africa he was expecting several chimpanzees and also some young gorillas, while a boat due the following day from Australia was bringing in a consignment of 60 kangaroos, several big red "boomas" and a number of rare birds. There were also other travelers on their way to Hamburg from different parts of the world with more or less valuable collections of wild animals. As to his present stock one has only to add that it is more valuable than the animals found in any one zoological garden the world over, to give some idea of its immensity and variety.

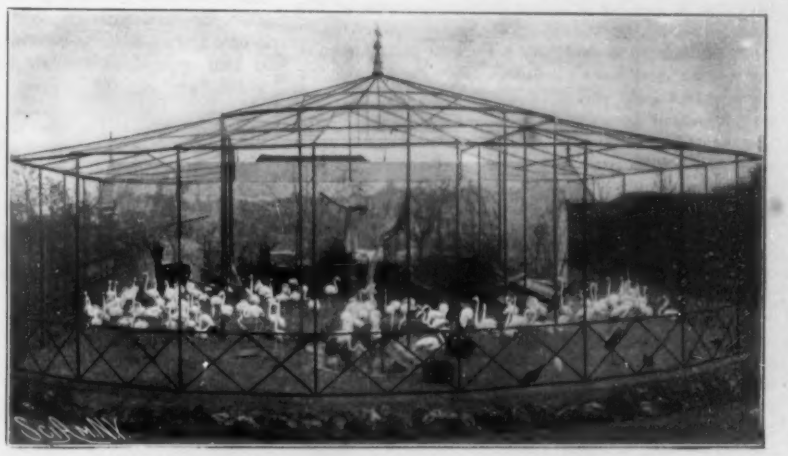
Indian Elephants Worth from $1 250 to $2,000 Each.

Altogether, Mr. Hagenbeck employs a staff of sixty European hunters. Many years ago he recognized the need of establishing depots in various parts of the world, from which he could replenish his stock as occasion required. He has five depots in Asia, three in Africa, several in Europe and one in America. These men employ the natives to catch the animals for them. Much could be written about the manner in which the various animals are captured. In Nubia, where most of the lions are now obtained, the natives, by carefully watching, know exactly when a lioness is about to have cubs. They then go to the den and kill the mother and carefully remove the young cubs to the camp, where they are brought up on tame goats' milk. When about two months old they are conveyed to the coast on the backs of camels and shipped to Hamburg. Lions are also obtained from Abyssinia and Senegal. The finest lion was that obtained from the Atlas Mountains of North Africa. This species now no longer exists, and there are only a few in captivity. Adult Nubian lions fetch $1,000 apiece; Senegal lions range in price from $500 to $750. Tigers vary in price from $375 to $1,500 apiece and more, according to variety and rarity of the animal. Siberian tigers, for instance, sell at the latter figure. They are large, beautifully striped creatures. In the winter they grow a long woolly winter coat. A very singular variety of the tiger tribe comes from Russian Turkestan. Its characteristic is that its hind quarters have brown stripes instead of black on a yellow ground. Mr. Hagenbeck imported one three years ago and sold it to the Berlin zoo. In Bengal Mr. Hagenbeck's agent employs a number of natives who catch adult tigers in pitfalls, while if they come across a mother with young she is at once shot and the cubs taken away and brought up on goats' milk.

It is the rarer animals, such as the hippopotamus, the rhinoceros, and the giraffe, that are difficult to secure. In the first place, it is practically impossible to secure an adult beast, and the young ones, when finally secured, are by no means easy to rear. The feeding of them is no light task. A baby hippo will drink thirty pints of milk a day, and a rhinoceros almost as much. To arrange for such a supply in a desert, hundreds and probably a thousand miles or more away from any civilized center, means that a large number of goats have to be kept with the expedition party. African elephants are also very scarce; indeed, only five have been imported into Europe since 1880. Mr. Hagenbeck puts this down to the recent wars in the Egyptian Soudan. A hippopotamus is worth from $2,500 to $3,000, a rhinoceros slightly more, while giraffes sell at from $2,500, according to size, age and condition of the animal.

Up to 1880 giraffes were very cheap, and were imported from the Egyptian Soudan in large quantities. Between the years 1880 and 1900, however, only three were brought to Europe, two from South Africa and one from Senegal. They are caught by African hunters, who search for them on their quick Abyssinian horses. When they come to a herd of giraffes they drive them forward as fast as they can at such a pace that it is impossible for the young ones to keep up with the mothers. They are then easily caught and supplied with little halters and finally brought into the camp, where they are fed on goats' milk, also on corn, and various kinds of plants. Zebras, unlike giraffes, are fairly plentiful. Mr. Hagenbeck showed me a letter from one of his travel-

Unshipping the Wild Animals at Hamburg.



A Model Aviary, Containing 102 Flamingoes and 100 Other Birds.

Herd of Camels at the Hagenbeck Depot in Siberia.

THE TRADE IN WILD ANIMALS.

ers informing him that at a recent drive which he had organized in German East Africa fully 400 zebras were surrounded, besides a number of antelopes, some of the latter being entirely a new variety. As the corral was not large enough the larger portion of these animals were allowed to escape. Finally, however, 85 zebras and 15 antelopes were captured.

Curiously enough, Mr. Hagenbeck does not insure his animals after dispatch from Hamburg. He prefers to take the risk. The insurance rates are much too heavy, for if proper care is exercised the mortality is very slight. In the case of large consignments Mr. Hagenbeck sends one of his own men to attend and feed the animals on the voyage. In a recent shipment to the Mikado of Japan, which included lions, Polar bears, panthers, kangaroos, antelopes, monkeys, as well as a collection of larger birds, such as eagles, vultures, etc., the whole collection arrived safely after a journey of nine weeks with the exception of one monkey. In another recent shipment of $17,500 worth of animals to the Sultan of Morocco, the mortality was very small, one tiger dying of sunstroke while crossing the desert, while one crane succumbed to seasickness on the voyage. The shipments to America have been particularly successful, the losses sustained through death or accident being very trivial.

In conclusion, attention may be called to Mr. Hagenbeck's recent experiment in the acclimation of all kinds of tropical animals and birds. He is firmly convinced that almost any tropical animal can be acclimated to stand a northern climate. During the winter of 1901-02 he kept out in the open at his park at Stellingen, a suburb of Hamburg, a pair of South African zebras, an African eland antelope, several Indian antelopes, large and small Brahma cattle, Indian deer, a pair of South African ostriches, a cassowary from New Guinea, several Indian and West African cranes, as well as other tropical waterfowl and birds. All these animals were placed in unheated stables and were allowed to go out in the open whenever they pleased. What Mr. Hagenbeck did was this: He left the dung in the stables from the middle of November until spring. When it got too high a part of it was taken away and new straw placed on top. This dung gives off a natural heat and makes a warm bed for the animals to lie down upon. During the winter referred to the thermometer in Hamburg registered a temperature as low as 10 deg. F., yet the animals kept exceedingly well. Indeed, Mr. Hagenbeck lost a number of other tropical animals at his other depot which were kept in heated stables. The Duke of Bedford is evidently a believer in this simple method of acclimating animals, for he is keeping three very fine giraffes, which he purchased last summer from the great dealer, during the past winter in unheated stables. Their bed consisted of 9 inches of peat upon which the dung was allowed to remain. Up to the time of writing the animals are quite healthy and doing well.

London, England.

HAVE THE LOWER ANIMALS OTHER SENSES THAN OURS?

BY J. CARTER BEARD.

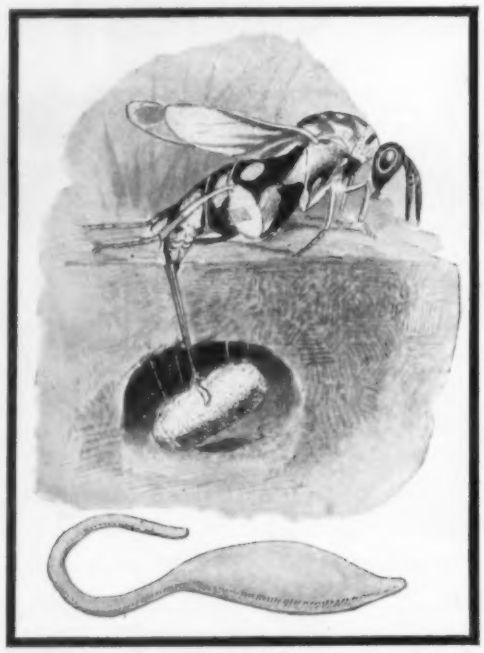
If a person who could see, were to find himself in a region, the inhabitants of which had never known or heard of creatures that were not, like themselves, blind, the use of his eyes might enable him to perform acts which must be incomprehensible to them.

Imagine the bewilderment and surprise of these unseeing people in their encounter with one who could describe objects and recognize individuals without contact, avoid pitfalls without ascertaining their existence by the sense of feeling, and even announce the presence of objects at a very considerable distance.

Doubtless such sightless folk, if they were reasoning beings, would try in various ways to account for their visitor's achievements.

In doing this, moved by the impulse that leads us to measure the faculties of others by our own limitations, they might be inclined to credit him with a development of hearing or of smelling or of some other power exercised by themselves in apprehending external things, sufficiently extended to meet the case. The simpler and, all things considered, the more probable explanation that the performer possessed a sense absent in themselves, might be the last to occur, or, perhaps, prove acceptable when suggested to them.

In their unwillingness to accept such an interpretation of the facts, they would follow many of our scientists, who, until quite recently, have been reluctant to admit that a number of the lower animals possibly possess other senses than ours. So much new and undeniably affirmatory evidence is, however, now being offered on this point, that there can be no longer any substantial reason for doubting that the five senses man imperfectly exercises are by no means all that are possible to sentient creatures. One such sense not possessed by human beings, but to a greater or less degree almost universally present in mammals, birds,



PARASITIC WASP PREYING UPON THE EGG DEPOSITED IN A WALL BY A MASON BEE.

reptiles, fish, and insects, is what perhaps may be called the sense of *localization*. It enables its possessor, apparently by its sole use, to find a desired spot. It is evidently closely connected with an instinctive and perfect memory of distance and direction. That the homing pigeon exercises it to some extent, though undoubtedly aided by the landmarks it recognizes, is indisputable; that the honey-bee has it in its fullness and perfection cannot, after the careful experiments of Albrecht Bethe in Germany, be doubted.*

Perhaps as striking an instance of its use as any, is that related of the ringed seal (*Phoca fœtida*), which furnishes the Eskimo of Greenland and of the Arctic archipelago with food and clothing. The female seal, when about to have young, forms for herself an *igloo* or domed cavity in the snow just above the breathing hole which she keeps open in the ice. Here her baby is born, and rests, sheltered from the fierce Arctic gales by the roof of snow overhead, on the ice near the breathing hole. To supply herself and the little creature with food, the mother seal has to swim for miles through water black as midnight without the faintest ray of light to guide her on her way; no light can penetrate the strata, dozens of feet thick, of ice and snow above. Aided by none of the faculties we exercise in apprehending external things, but by some mysterious power, of which we can form little or no conception, she follows swift, elusive fish in all their turnings, secures her prey, and returns, unerringly, to her own particular At-luk, or breathing hole, however distant, where her young one awaits her.

I. H. Fabre, the celebrated French entomologist, tried several experiments with mason bees (*Chalicodoma pyrenaica*); results which are useful in confirming those of Bethe on the honey-bee, and still further strengthening his position, insomuch as the mason bee is very different from the former, living as it does but a short time in the winged state, and not having opportunity to become acquainted with localities as distant as those to which Fabre carried it. One of these series of experiments made with bees, testified very convincingly to the fact that the sense of sight has nothing at all to do with the recognition of objects or of localities by the insects in question. A bowlder, to which a partially finished nest of a Chalicodoma was attached, was, during the temporary absence of its builder, removed a short distance, but in plain sight of the place formerly occupied by it. The bee returning, flew quickly to the spot where she had been carrying on her building operations, and walked about over the place, evidently much puzzled to imagine what had become of her unfinished dwelling. She then flew off, but speedily returned, and again sought diligently in the selfsame spot for her absent nest. This she did a number of times, occasionally passing in her flight within a very few inches of the object she was in search of, without once recognizing it. When the nest and the bowlder to which it was attached were moved back again to within a very short distance of the locality to which she had always returned, the bee would at times actually alight upon the stone, visit the nest, run about over the bowlder as if to examine it, and then fly away again.

It is evidently its location in space and not its appearance that enables the bee to recognize its nest. Another nest put in place of her own was adopted by *Chalicodoma*, without any question, although the nests were very different in appearance, the one consisting of a single incomplete cell, and the other of many cells.

These same powers and the same limitations belong to this localizing sense in wasps. *Bembex*, for instance, forms her nest in sandbanks that are sometimes acres in extent. Before leaving her burrow, the insect covers it over with sand, masking it so completely that it is entirely indistinguishable from the surrounding surface. On revisiting the nest, however, which she has to do in storing it with food, she flies without hesitation directly to it.

The little wasp (*Cerceris tuberculata*) possesses this sense in a high degree, perhaps also another, for in choosing the beetles with which to store the burrows she digs in the soil for her future larvæ, she never gets outside a particular family of these insects, but, remarkable as it may appear, will take specimens altogether different in appearance, shape, size, and color, provided they belong to the right family. The range of selection, so wide in respect to varieties, so limited as to kind, seems to point to some sense of which we know nothing, but which supplies Cerceris with the power of discrimination required.

Fabre captured a dozen female *Cerceris*, dropped a spot of white paint on the thorax of every one, put each into a paper roll, put the rolls containing the prisoners into a box from which they were liberated one and a quarter miles from home. Five hours afterward, when he visited their home, four had returned, and he had little, if any, doubt that the others also found their way there. He afterward took nine of the insects to the town of Carpentras, a distance of two miles, and released them in the public street, in the center of a populous quarter. Each wasp, on being released, rose vertically high enough between the houses to clear the roofs, and flew off in a southerly direction, in a beeline for her nest. On visiting the homes of the little wasps next day, he

* Psychical Qualities of Ants and Bees. Albrecht Bethe. Dürfen wir den Ameisen und Bienen psychische Qualitaten zuschreiben? Archiv f. d. Ges. Phys. Vol. LXX, pts. I, II, pp. 15-100. January, 1858.

SECTION OF THE HOME OF A RINGED SEAL AND HER SUCKLING YOUNG.

found that at least five out of the nine had "put in an appearance."

But perhaps the strangest instance of the possession of some sense unknown to us, occurs in the case of the parasitic wasp Leucopsis (*Leucopsis gigas*). Leucopsis lays her eggs in the cells built by the mason bee Chalicodoma. The cell of this bee is placed in a mass of solid masonry, a part only of which is occupied by cells. Every cell is built with hard mortar, making an uneven surface, and access is rendered even more difficult by a layer of sun-baked clay spread over the whole. Leucopsis has perhaps to work uninterruptedly for three hours with the tools nature has furnished, to penetrate the defense provided by the mason bee for the egg and food stored in the cell. But the covering is uniform over the whole structure. How is Leucopsis to know that after all her work may not be in vain; that she may not penetrate masonry that covers no cell? This problem is easily solved by the wasp, who walks slowly and, so to speak, thoughtfully over the clay, tests it with her antennæ, and unfailingly selects the right spot to begin her work, which of course is to obtain access to the larvæ of the mason bee, upon which her young will feed when the egg she lays there is hatched.

It is, to make the matter plain, as if a person were able to determine by feeling of the walls, three or four feet thick, of a prison, just where cells tenanted by the prisoners were situated.

Examples of insects that possess an X-ray sense, not only among European but our own *hymenoptera*, can be multiplied indefinitely. Only one or two of the senses peculiar to the lower animals are here noticed. Lubbock suggests that "there may be fifty of them."

I do not know any more interesting field for zoological research and experiment than this—a field open to any one who has the requisite patience and love of nature to explore it.

ARTEMIEV'S ELECTRICAL COAT OF MAIL.

BY EMILE GUARINI.

The Russian physicist, Prof. Artemiev, recently delivered a lecture before the German Association of Electrical Engineers, in which he exhibited and described his garment for affording protection against high electrical tensions.

The object of this garment is to avoid all the inconveniences and dangers which accompany the use of protecting gloves. A glove protects but a small part of the body, so that other parts of the body may come into accidental contact with high-tension conductors. The protection afforded is therefore inadequate. Furthermore, the thickness of the rubber of which gloves are made is such that absolute freedom is not possible. Invisible defects in the material of which the glove is made may give but an illusory protection. The tests which were made at the time of the open contest in France two years ago fully demonstrated the inadequacy of the rubber glove.

Artemiev proposes to protect not simply the hands, but the entire body. He has devised an envelope, impenetrable to electrical masses capable of producing electrostatic discharges. By means of this garment it is possible to conduct to the earth any high tension current with which the person who wears the garment may have come in contact. The garment also places in short circuit two parts of the body which may be in contact with high but different potentials.

These results are obtained by Artemiev by a very pliant coat of chain mail, somewhat similar to that worn by the knight of the Middle Ages.

Fig. 1 shows the effect of the protective coat when placed in the secondary circuit of a transformer of which the tension is 150,000 volts. The spark is produced between the hand and the pole of the transformer, without the slightest danger to the wearer of the coat. In the other hand a conductor is held connected by a spark with the other pole of the transformer.

In Fig. 2 the metallic coat plays the same part as a metallic conductor which breaks the spark of an oscillator. Although the tension is excessively high, the wearer of the coat is in no wise injured, although he is insulated from the soil which is in more or less good contact with him.

Fig. 1.—THE COAT OF MAIL SHIELDING ITS WEARER FROM A TENSION OF 150,000 VOLTS.

Fig. 2.—THE COAT OF MAIL ACTING AS METALLIC CONDUCTOR TO BREAK THE SPARK.

Fig. 3.—A DISCHARGE BETWEEN A CONDUCTOR OF HIGH TENSION AND THE PROTECTED HAND.

Fig. 3 shows the discharge between a conductor of high tension and the hand of the wearer of the coat. The protecting garment is connected with the earth by reason of the contact established by the feet with the soil.

During the course of these experiments, which were made by the well-known firm of Siemens and Halske of Berlin, it was decided to ascertain what amount of heat developed by passing a current of high tension through the garment. It was thought that if too great a heat were developed the consequences might be serious for the person who happened to wear the coat, and might result even in burning him alive. It was found as a matter of fact that some heat was developed.

The results obtained during the experiments are most valuable. It was found that when the coat's resistance between the two hands was 2-1,000 w., a current of 350 amperes would not augment the temperature to any appreciable extent. With a coat offering the resistance mentioned, it was possible, but only for a few instants, to send through the coat a current of 1,000 amperes, without any danger. How is the protective action of this peculiar garment to be explained? Two theories can be offered.

The electrical coat of mail may be compared with a Franklin cage, the interior of which, containing the body, cannot be penetrated by any electrostatic charge. By virtue of the law of derived currents, and as a consequence of this law, the second theory holds that the current will pass almost entirely through the metallic links, a negligible part passing through the human body, of which the resistance is very high, compared with that of the garment. In other words, the current follows the path of least resistance.

The Current Supplement.

The current SUPPLEMENT, No. 1428, presents the second and concluding installment of Mr. Day Allen Willey's admirably illustrated account of the Krupp Works at Essen. J. T. Milton and W. J. Larke tell something of the decay of metals. F. Giesel, whose experimental work with radium has attracted the attention of scientists the world over, writes on the "emanation substance" from pitchblende, and on radium. The Serpollet steam automobile is to be fully described, and its parts illustrated in detail, in the columns of the SUPPLEMENT. The first installment of the article on the automobile appears in the current issue. Lieut.-Col. H. A. Yorke's report of his visit to America is concluded. Camille Mercader has devised a method of hydraulically manufacturing hollow axles. An article from his own pen on the subject should be of interest. Excellent illustrations accompany the text. An investigation of a garbage crematory is the subject of a report made by Rudolph Hering to the Special Committee on Crematory of the City Council of Trenton, N. J. The report is valuable for the practical information which it contains. An abstract of the code of Khammurabi, an ancient king who seems to have given civilized mankind its laws, is also published in the SUPPLEMENT for the benefit of our archæological readers. The Crompton potentiometer for electrical measurements with direct current supply describes a means of measuring the electrical current directly from the supply. "How Land Yachts Are Made from Old Bicycles" is the title of a practical article of no little value. Sir Oliver Lodge recently read a paper before the Institution of Electrical Engineers, in which he outlined his theory of electrons; the paper is to be published in full in the SUPPLEMENT. In the current SUPPLEMENT the first installment of the paper will be found.

How to Get Rid of Rats.

All tradesmen, being liable to the incursions and depredations of rats, it may not be out of place to mention a method of getting rid of these pests which is recommended by a correspondent of the Birmingham Daily Post. This consists in thinning down with petroleum ordinary slow-drying tar-varnish such as bedstead makers and japanners use and pouring the mixture into the runs of the rats. The vermin are said to loathe the smell of the stuff, and will do anything to get clear of it. A still more effective plan is said to be to catch a rat alive, dip it up to the neck in the varnish and turn it loose. Its fellows will flee from it as from the de'il. The dipping process is said to be harmless to the rat. But some ironmongers may not care to "dip a live rat up to its neck."

A Record Issue of the Patent Office Gazette.

The Patent Office Gazette, which issued on May 5, is the largest ever published. On May 5 828 patents were granted. The best previous record was that of April 29, 1902, when 764 patents were issued.

A NEW ELECTRICAL STEERING GEAR.

BY OUR ENGLISH CORRESPONDENT.

A few weeks ago we drew attention in the SCIENTIFIC AMERICAN to a new electrical steering gear that had been devised by the Earl of Crawford, and had been subjected to several experiments upon his yacht "Valhalla" in the Solent. The results of these experiments established the efficiency of the apparatus, and its value when employed under certain conditions, but it possessed several inherent imperfections, which have now been remedied. An experimental installation has been made, and is now in operation at the works of Messrs. Siemens and Halske, of London.

In design, this steering gear is very similar to the type usually fitted on large yachts for hand steering, and has been only slightly altered so as to adapt it for electrical driving.

It consists essentially of a solid cast-iron frame bolted to the deck. The upper end of the rudder-post passes through the base of the frame, and carries, securely keyed to it, a massive cross piece. Above this, and running fore and aft, is a right and left handed screw supported in the frame and carrying one right and one left-handed nut, which are supported and prevented from turning by two guides running parallel with the screw. These nuts are connected by links, one to each side of the cross piece on the rudder post, and by this means the turning of the screw operates the rudder. The steering wheel is sufficiently large to be used in the case of an emergency, for hand steering, and it is carried on a sleeve on an extension of the screw, with which it can be connected by means of a claw clutch.

A Siemens four-pole completely inclosed motor is arranged so as to drive the screw through several reductions of spur gearing, and through a claw clutch. This latter is connected with that on the steering wheel, in such a manner that both are operated by one lever, and only one can be in gear at a time. From this it will be seen that the screw, which operates the rudder through the nuts and links, is capable of being turned either by the electric motor or by the steering wheel, but not by both simultaneously.

The electric motor is series wound and is provided with a brake, pulley, and brake blocks, which are held off by an electromagnet, in series with the motor and held on by a suitable spring. The brake is therefore applied, and the motor is thus promptly pulled up whenever the current is interrupted.

The motor is controlled by two special starting switches, one for each direction of rotation, instead of using a single reversing switch, as by this arrangement it is possible to obtain an absolutely trustworthy and quick brake action.

Each switch has three contacts, so that resistance can be cut out in two steps, and the contacts are so shaped that the actual contact surfaces are not touched by the arcs, and therefore remain in good condition. Each contact is reversible, and can be easily and expeditiously renewed in a few minutes. A powerful magnetic blowout is provided on each switch, which is in operation on all the contacts.

Although the potential of the requisite current is so very low, being not more than 25 amperes at 100 volts, these ample precautions against arcking troubles have been taken, owing to the sudden and frequent switching on and off, which is required in the ordinary steering of a ship. They have proved quite satisfactory in practice.

The operation of the starting switches is accomplished as follows: The two switch arms are mounted on two pins on a metal disk and at equal distances from its center. The disk is geared to the screw, and its motion is therefore proportional to that of the rudder. The switches have cranked arms, as shown in the drawing, which can be pushed so as to put the switches on or off, by stops, on a second disk mounted concentrically with the first.

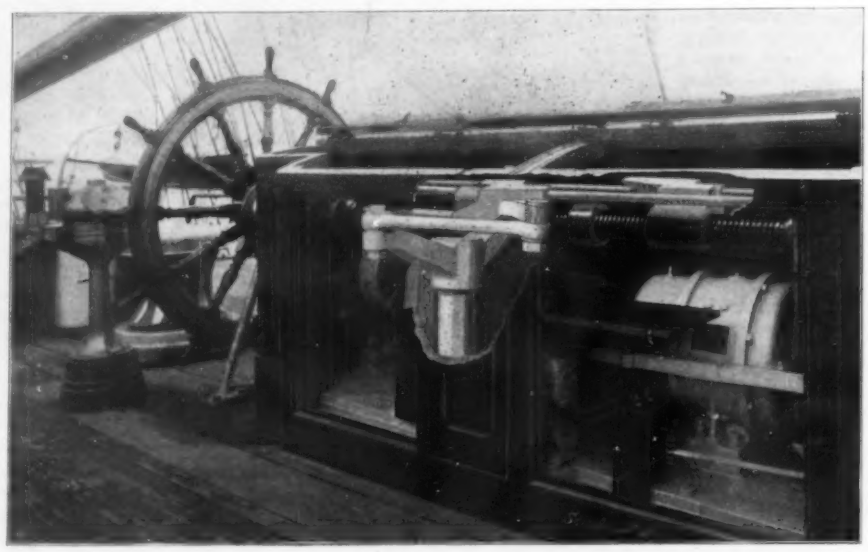
The second disk is in gear with the steering wheel, and its motion is therefore proportional thereto. The switching on or off is consequently the result of the difference in the motions of the two disks, which are proportional to that of the rudder and the steering wheel respectively.

The cranked arm of each switch is so shaped that it clears the stops on the second disk when the motion is in one direction, but engages them when the motion is in the opposite direction. This insures that one switch only is operative in each direction of rotation.

Both switches are pulled to the off position by springs so as to get a quick break, but they are also pushed off positively by the stops, so that the breaking of a spring does not incapacitate the gear in any way, but only makes the brake rather slower. The disks are further provided with massive stops arranged to limit the difference of their motion to little more than the amount actually required to operate the switches.

The gearing is such that twelve complete turns of the steering wheel move the rudder from hard a-port to hard a-starboard—a total angular distance of 80 degrees. A Geneva stop is provided on the second switch disk, which prevents the steering wheel from turning more than twelve complete revolutions. When the Geneva stop is reached, the second disk is stopped and the first catches it up, so that the motor is automatically switched off when the extreme positions of the rudder are reached.

The trials which have taken place on the "Valhalla" have been attended with complete success, and the control of the ship was as perfect as could be desired, and gave complete satisfaction to the navigating officers. The test imposed by them, which was considered the most severe, namely, throwing the rudder from hard a-port to hard a-starboard while steaming at full speed astern, was accomplished with ease and without excessive consumption of current.



AN ELECTRICAL STEERING GEAR.

RECENTLY PATENTED INVENTIONS.

Agricultural Implements.

DITCHING-PLOW.—B. D. LEMERT, Fort Morgan, Col. This apparatus clears weeds and other obstructions from both field and head laterals of irrigating-ditches, and makes new irrigating-ditches; it obviates rocking or "side flopping"; it provides means for raising the plow clear in order to transport the device or turn the plow around; means for changing the width of the machine for ditches of varying widths, and for adjusting for deep or shallow ditches; and means for running the axle freely and easily in the boxes.

Engineering Improvements.

MARINE-ENGINE GOVERNOR.—P. V. CORNILS, Seattle, Wash. This new and improved governor is controlled by the pressure of the water on the sides of a vessel to insure a proper cut-off of the steam and a consequent reduction of the speed of the propeller and decrease in the vessel's momentum at the time the low water reaches the propeller, so that the latter is prevented from racing.

ROTARY ENGINE.—H. M. HJERMSTAD and E. O. SOLIN, Hader, Minn. The engine has an eccentrically-mounted piston carrying wings or piston heads which run on a concentric guide and there thereby caused to move in and out relatively to the piston as the piston turns. The steam is passed through the cylinder in a continuous stream, thereby to act by impact on the wings or piston-heads and impart a continuous rotary movement to the piston and its shaft.

GAS-ENGINE.—W. J. MCVICKER, Rogers, Neb. The engine in this invention belongs to explosive-engines of the four-cycle compression type; and the object of the improvement is the provision of a new gas-engine which is simple and durable in construction, effective in operation, and arranged to utilize the exhaust-pressure for actuating the exhaust-valve.

Mechanical Devices.

ROTARY STRAINER.—C. EDGERTON, Philadelphia, Pa. The special design of this invention is a device for removing the oil or grease which rises from garbage, meat scraps, etc., while being cooked. It is applicable to many analogous uses. The improvement consists of a perforated chamber strainer combined with means for rotating it and a scraper for scraping the surface of the chamber while rotating, so as to clear the holes of all materials. Means are supplied for supporting and turning the strainer, and taking off the liquid which passes through the rotary strainer.

TREAD-POWER MOTOR.—E. PARKER, Cumberland, Iowa. This mechanism is arranged to permit of conveniently changing the inclination of the tread-wheel to utilize the animal's power to the fullest advantage for various kinds of work without requiring undue exertion to run the motor powerfully at a slow speed or with less power at high speed.

MACHINERY FOR ROLLING SHEET OR OTHER METAL STRIPS OR BARS OF CURVED OR OTHER SECTION.—G. B. JOHNSON, 8 Victoria Street, Westminster, London, England. Mr. Johnson's invention relates to machinery for longitudinally corrugating or fluting sheet-metal strips; and the object is to substitute for the operations of stamping in dies a series of progressive continuous cold-rolling operations, whereby the metal is brought at a single pass through the series of sets of rolls from the form of a flat strip to that of the longitudinally-corrugated reversely-curved section required.

BORING AND REAMING MACHINE.—G. A. ENSIGN, Defiance, Ohio. Provision is made in this invention for a machine arranged to permit convenient, quick, and accurate shifting of the work-holder, to allow of first boring the work and then reaming it without removing the work from the work-holder, thus insuring the formation of an accurate hole.

FOLDING-MACHINE.—L. E. ELSON, New York, N. Y. In this case the invention has reference to folding machines particularly adapted for folding fan-tops or other blanks having a segmental form. Folding of this character is usualy done by handwork which is a slow process, not always resulting in even folds or plaits. By means of the machine the folds may be evenly and quickly made, with a resulting reduction in the cost of manufacture.

MACHINE FOR FASTENING FAN-STICKS TO FAN-TOPS.—L. E. ELSON, New York, N. Y. The machine provided by this invention has a very simple construction and is adapted to fasten fan-sticks to folding fan-tops in a very expeditious manner. By the simple manipulation of a plunger-plate, the fan-top, on which an adhesive has been spread, is passed under the fan-sticks and automatically clamped against them, thus practically completing the formation of the fan.

Medical Devices.

RECTAL OR VAGINAL SPECULUM.—O. H. KOHLHAAS, Calumet, Mich. The speculum has a skeleton frame made preferably in two longitudinal jaws, separable or adjustable for dilating the passage in which the instrument is inserted. Means are provided whereby the rectal or vaginal passage may be illuminated for surgical operation, also devices for grasping inflamed or diseased tissue and morbid growths requiring treatment, and devices for cauterizing such parts by aid of a galvanic current.

CLINICAL THERMOMETER.—O. G. BELL, Norwich, N. Y. The intention of this improvement is to furnish a new clinical thermometer arranged to protect the glass casing against breakage at both ends and to allow of convenient filling of the casing with an antiseptic solution in which the instrument is held immersed when inserted in and secured to the casing.

Vehicles and Their Accessories.

SIDE-DUMPING BODY FOR VEHICLES.—W. L. CHESSROWN, Eaton, Col. The purpose in the present case is to provide a side dump wherein the dumping will be automatically accomplished the moment that supports beneath the body are withdrawn, which is done by a single movement of a single lever, and, further, to so construct the body that as it is restored to its normal position the side gate opened for dumping will be automatically closed. The body or rack may be used on any wagon-gear, and is adapted for hauling sugar beets, and for all farm purposes and upon any hauling or dumping vehicle, including railroad cars.

Miscellaneous.

WASHBOARD. — CATHERINE HARDWICK, New York, N. Y. The purpose of the inventor is to so construct a washboard that it may be adapted to any form of tub and lie therein in such manner, as not to materially interfere with the clothes to be washed and so that the board may be operated upon in the most convenient manner and be strongly braced.

GATE.—A. C. HUNT, Naco, Arizona Ter. The improvement provided by Mr. Hunt's invention relates to a gate constructed principally of wire and connected with a swinging frame which holds the wires distended and which has attached to its free portion a device for engaging the post and stretching the wires taut in connection therewith.

METALLIC PACKING.—W. G. WATSON, Ogden, Utah. The object in view in this invention is to provide a new and improved metallic packing which is simple and durable in construction, effective in operation, and arranged to positively prevent leakage and undue wear on the piston-rod, valve-stem, or other movable part on which the packing is used.

STAIR-ROD AND FASTENING THEREFOR.—I. V. MEAD and J. W. GIBSON, New York, N. Y. Provided by this invention is a construction of stair-rods and fastening devices therefor, so that the rods and their fasteners will be concealed by the carpet which the rods serve to hold in position where the steps and risers of a staircase meet. The device is capable of firmly holding the carpet in place without injuring it and of being conveniently reached when the carpet is to be secured to or removed from the stairs.

SHOE-POLISHING STAND.—R. G. POLSON, Leadville, Col. During the polishing operation this device firmly holds a boot or shoe in place. It is adapted for use in the household, as well as in barber-shops, hotels and other places. Means are provided for raising or lowering and changing the angle of accommodation of the shoe rest; also means for clamping soles and heels on boots and shoes of different sizes.

FASTENING DEVICE FOR FURNITURE.—W. E. NELSON, New York, N. Y. This device secures the upper structure of chiffonniers, bureaus, and the like to the top slab or board of the body of the article in such manner that the locking device will be invisible from the front or sides and may be quickly brought into and out of action. The device will firmly hold the superstructure to the base, and admit of the superstructure being readily removed from the base.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**
MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 4138.—For manufacturers in New York of advertising novelties, horse and cattle foods, boots and American vehicles.

AUTOS.—Duryea Power Co., Reading, Pa.

Inquiry No. 4139.—For makers of machinery for manufacturing paper from wood pulp.

Morgan Emery Wheels. Box 517, Stroudsburg, Pa.

Inquiry No. 4140.—For makers of umbrella machinery.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 4141.—For parties to make a direct force pump.

For bridge erecting engines. J. S. Mundy, Newark, N. J.

Inquiry No. 4142.—For the manufacturers of the "Crowell" positive pressure blower.

Coin-operated machines. Willard, 284 Clarkson St., Brooklyn.

Inquiry No. 4143.—For makers of chemical balances and reagents for chemical analysis.

Blowers and exhausters. Exeter Machine Works, Exeter, N. H.

Inquiry No. 4144.—For the manufacturer of the Buckingham typewriter.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 4145.—For machinery for pasteurizing milk.

Partner wanted to defray cost patenting useful desk novelty. Box 24, Stroudsburg, Pa.

Inquiry No. 4146.—For makers of carding machines for wool, cotton, etc., also for makers of curled hair machinery.

Mechanics' Tools and materials. Net price catalogue. Geo. S. Comstock, Mechanicsburg, Pa.

Inquiry No. 4147.—For manufacturers of gas engines.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 4148.—For makers of cheap, strong barrels, either metallic or wooden, for holding material in paste form.

Let me sell your patent. I have buyers waiting. Charles A. Scott, Granite Building, Rochester, N. Y.

Inquiry No. 4149.—For makers of small dredges, steam or gasoline engine.

Machinery designed and constructed. Gear cutting. The Garvin Machine Co., 149 Varick, cor. Spring Sts., N. Y.

Inquiry No. 4150.—For manufacturers of cast aluminium numbers.

WANTED.—Agencies for American goods salable in Burma. Address J. Whitfield Hirst, Sule Pagoda Road, Rangoon, India.

Inquiry No. 4151.—For manufacturers of novelties, toys, tennis shoes for use on asphalt courts, etc.

Manufacturers of patent articles, dies, stamping tools, light machinery. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 4152.—For makers of a combined potato and apple parer, corer, grater and slicer for family use.

Crude oil burners for heating and cooking. Simple, efficient and cheap. Fully guaranteed. C. F. Jenkins Co., 1103 Harvard Street, Washington, D. C.

Inquiry No. 4153.—For makers of small magnetic toys, such as steel horseshoe magnets, etc.

The largest manufacturer in the world of merry-go-rounds, shooting galleries and hand organs. For prices and terms write to C. W. Parker, Abilene, Kan.

Inquiry No. 4154.—For dealers in an ink well patented June 23, 1885, No. 562,754.

Experienced mechanical draughtsman wanted. Permanent employment assured to rapid and accurate draughtsman. Mill Work, Box 773, New York.

Inquiry No. 4155.—For makers of superheaters.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 4156.—For a second-hand Star carpet beater, in good condition and cheap.

PATENT FOR SALE OUTRIGHT.—Agricultural machine of the greatest promise at a low figure with privileges of foreign patents. John Joyce, Box 773, New York.

Inquiry No. 4157.—For a swivel of the size used on double razor strops.

Contract manufacturers of hardware specialties, machinery stampings, dies, tools, etc. Excellent marketing connections. Edmonds-Metzel Mfg. Co., 778-784 W. Lake Street, Chicago.

Inquiry No. 4158.—For manufacturers of cement.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $5. Munn & Co., publishers, 361 Broadway, N. Y.

Inquiry No. 4159.—For makers of iron rolling barrels.

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Inquiry No. 4160.—For manufacturers of toy balloons.

Inquiry No. 4161.—For a light weight automobile engine of 40 h. p. to be used for motor plow.

Inquiry No. 4162.—For makers of special sized disks.

Inquiry No. 4163.—For the manufacturers of the front-cut rear-delivery automobile harvester.

Inquiry No. 4164.—For makers of molds for making plaster Paris and cement ornaments.

Inquiry No. 4165.—For makers of copper wire which will stand temperature of 500 degrees or more.

Inquiry No. 4166.—For makers of plumbers' supplies to furnish material to a master plumber.

Inquiry No. 4167.—For makers of pearl button machinery.

Inquiry No. 4168.—For machinery for making tar paper and roofing felt.

Inquiry No. 4169.—For makers of vinegar-making supplies and cordage machinery.

Inquiry No. 4170.—For makers of light wooden boats of different sizes.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of prices.
Minerals sent for examination should be distinctly marked or labeled.

(9004) E. O. M. asks: 1. Suppose two wire circuit telephone lines to be well insulated. If the return wires of the two lines be connected, will static induction produce any sound on one line while the other is being used? A. Telephone lines are put up in the manner you describe and work well. The system is called the Common Return System. One wire answers for a return wire for a large number of telephones. You will find it described in Miller's "American Telephone Practice," price $3. 2. Is not the purpose of compound winding on a dynamo to secure the same number of ampere turns in the field at all loads? And if the ampere turns in the field and the speed remain constant, will not the potential always be the same? A. The compound-wound dynamo gives a better regulation of the voltage at varying loads than any other form of winding. Of course this results from the quicker adjustment of the field upon a change of load. The current through the series and the shunt rises and falls, but the total current through the field does not vary, and the ampere turns do not vary except within narrow limits.

(9005) L. D. asks: Would there be any difference in the register of a thermometer exposed to the north wind, and shielded from same, other conditions being the same? A. A thermometer takes the temperature of the place in which it is. Merely shielding it from the wind, conditions otherwise being the same, would not change the reading of the thermometer. Probably conditions could not remain the same for any length of time. The moisture of the air would change in a quiet space, and the heat radiated from the ground and surrounding objects would also affect the reading of the instrument.

(9006) H. T. R. says: In noticing questions 8794, page 48, January 17 number of SCIENTIFIC AMERICAN, would like to ask a few questions regarding the "water pail forge." 1. About what thickness should the sheet lead be? A. The sheet lead for a water pail forge may be of any thickness, since it only acts as a conductor, and is not used up by the current. Lead 1-16 inch in thickness is ample. 2. What do you call common washing soda? A. Washing soda is carbonate of soda. We supposed it was kept at every grocery in the country. If not available, throw a handful of common salt, table salt, or cattle salt into the water, and it will answer just as well. It serves to render the water a conductor of electricity. 3. How can I find the specific gravity of water and know when it is at 1.15? A. The specific gravity of water is unity, or one. The density of all other substances is compared with that of water. If you follow the above directions, you need not know the specific gravity of the liquid. A handful of washing soda will do as well as a handful of salt. The quantity is entirely immaterial; several handfuls may be used if you wish. Put in all you please, till no more will dissolve. 4. How can I find the positive and negative wires of a 220-volt direct current line that we have in our shop for lighting purposes, and will a current of this capacity answer as well as if it were near the generator? A. If you have not a pole detector of some kind, you cannot determine which is positive, but you can proceed as follows: Connect up to the line without reference to the polarity of the wires, and try the bar in the pail. You will know if you are right by the sudden flash of light and great heat produced. If there is only a simmering in the pail, with little light and heat, reverse the connections. Connect the rod to be melted to the wire which was attached to the lead, and the lead to the wire to which the rod was attached, and try again. You will not have to try but two ways; one must be right.

(9007) M. E. S. writes: Our Masonic lodge has an arc stereopticon which works fine with one exception—our electric light system is alternating, which causes a loud humming or buzzing when using the lamp that is extremely amazing. What I want to know is, can anything be done to do away with the noise? Any suggestion will be very much appreciated. A. You cannot do away entirely with the humming of an electrical arc lamp run upon an alternating current. The alternations themselves produce the musical tone. A short arc will, however, run more quietly than a long one.

(9008) W. F. W. asks how to ink typewriter ribbons. A. Take vaseline (petrolatum) of high boiling point, melt it on a water bath or slow fire, and incorporate by constant stirring as much lampblack or powdered dropblack as it will take up without becoming granular. If the fat remains in excess, the print is liable to have a greasy outline; if the color is in excess, the print will not be clear. Remove the mixture from the fire, and while it is cooling mix equal parts of petroleum, benzine, and rectified oil of turpentine, in which dissolve the fatty ink, introduced in small portions by constant agitation. The volatile solvents should be in such quantity that the fluid ink is of the consistence of fresh oil paint. One secret of success lies in the proper application of the ink to the ribbon. Wind the ribbon on a piece of cardboard, spread on a table several layers of newspaper, then unwind the ribbon in such lengths as may be most convenient, and lay it flat on the paper. Apply the ink after agitation, by means of a soft brush, and rub it well into the interstices of the ribbon with a toothbrush. Hardly any ink should remain visible on the surface. For colored inks use Prussian blue, red lead, etc., and especially the aniline colors. Aniline black, ½ ounce; pure alcohol, 15 ounces; concentrated glycerine, 15 ounces. Dissolve the aniline black in alcohol, and add the glycerine. Ink as before.

(9009) A. W. says: In your column of answers to inquiries would you please give the chemicals used in the best portable fire extinguishers? Are the liquids employed liable to freeze at a temperature of 30 deg. below Fahr.? Would a metal vessel, well galvanized, be a suitable receptacle for the other liquids than the acid in the construction of a fire extinguisher? A. The Babcock fire extinguisher is charged with a solution of bicarbonate of soda in water and sulphuric acid in a lead bottle, which, when required, is turned over by a crank, spilling the acid into the charge of soda water. Carbonic acid gas is instantly generated, by which a pressure is obtained sufficient for throwing the whole contents of the apparatus with much force through a nozzle for fire purposes. Use of sulphuric acid, 5 parts, bicarbonate of soda, 6 parts, by weight. Other combinations are used, such as carbonate of ammonia, potash, etc. Iron can be used for the alkaline reservoirs.

(9010) C. M. writes: We have a gasoline engine, balance wheel 18 inches in diameter, ½-inch web, rim 2½ inches thick, one 5-inch wheel, and are desirous of running the same at speeds 1,000 to 2,000 revolutions per minute. We are aware that this will give us a speed greatly in excess of that employed in flywheel constructions. We shall be greatly obliged to you if you could give us your opinion in the matter by return mail. A. You can run your engine at 2,000 revolutions per minute with safety, if flywheel has no flaws. The centrifugal strain on the rim will be about 2,250 pounds per square inch, or one-seventh the breaking strain of cast iron.

(9011) J. W. W. asks for information in regard to the manufacture of ethyl alcohol from acetylene C_2H_2 or other gases in the electric arc. A. In the Willson process, calcium carbide is made in usual manner in the electric furnace. The acetylene obtained on treating the carbide with water is converted to ethylene by allowing it to pass through a solution of chromium and ammonium sulphates, maintained at a temperature of 40 deg. C. The ethylene is then absorbed in sulphuric acid, and the hydrogen ethyl sulphate produced is distilled after the addition of water. The ethyl alcohol obtained in the distillate is said to be very pure. With carbide at $20 per ton, the alcohol costs eight cents per gallon.

(9012) L. D. writes: Suppose that the temperature of a room is 60 deg. Fahr. and the relative humidity is 65 per cent and that the temperature of the air outdoors is zero. Now, when one scuffs one's feet over a carpet in the room, and then touches a brass object with one's finger, a spark called "electricity" is produced. Now, under the same internal conditions, but with the temperature outside at 50 deg., no such action takes place. Now, will you please tell me: Is the spark electricity? If so, how is it produced? Has the temperature of the outer air any effect on the action? If so, how, and why? How is the current powerful enough to pass from one's feet to one's hands? How does the current travel when one touches a brass gas jet on the wall? Does it go back to the carpet? If so, why can one get a "shock" by touching a piece of brass on a glass plate? When a motorman turns the lever of the controller to the first notch, do the motors take from the trolley wire the same amount of current as when they are running at full speed? In other words, is the same amount of current taken from the trolley wire, no matter at what speed the motors are running? A. When one with dry feet scuffs along a woolen carpet on a cold, and therefore probably a dry day in winter, both the carpet and the person become charged with electricity, the woolen carpet positively and the person negatively. When a person thus charged approaches a metallic object, such as a brass gas jet, his negative charge attracts positive electricity from the earth to the end of the jet nearest to him. When he gets near enough to the jet, a spark jumps across, discharging the electrical tension both of the person and the gas jet. We call the spark "electricity," but it is matter which the electricity causes to shine. We do not see electricity. This can be done only in cold dry air, since moisture upon objects discharges electricity or prevents it from collecting and remaining upon objects. Such a current of electricity can flow with ease through a person, and a person standing on a woolen surface can be charged from head to feet by scuffing the feet over the wool, since wool is an insulator. We need not suppose that the current finds its way back to the identical spot on the carpet on which the feet scuffed. The carpet is in contact with the earth, and the earth is the great equalizer of electrical charges. We would suggest the attentive reading of Thompson's "Elementary Lessons in Electricity," price $1.50 by mail, in which all these phenomena are fully discussed, and principles given. The street car controller generally is arranged so that at first the two motors are in series, with an external resistance. Next they are in series with no external resistance. They are then put in parallel with an external resistance, and last they are thrown on the lines in parallel with no external resistance. They then get full current and go at full speed. You will see the reduction of resistance at each step of the controller, and as the resistance is reduced the current is increased. Your question is answered, No. Through a high resistance less current must flow than through a low resistance. This is in accordance with Ohm's law.

(9013) W. P. S. asks: Which will subject the chain of a bicycle to the greater strain or tension—one with large sprocket wheels, or one with small sprocket wheels? The gear of the wheel and load remaining the same, and other things being the same. A. The small sprocket wheels give the greatest strain on the chain, and in proportion to their diameter.

(9014) H. M. K. says: Is all the water which is found in pipes conveying natural gas, due to the gas cooling and thereby depositing its moisture, or does a minute portion of it accumulate there through capillarity from without? A. The water found in the pipes conveying natural gas is the condensation from the cooling of the saturated gas, or possibly a small portion of water jetted from the bottom of the pipe by the velocity and pressure of the gas flow. There can be no capillary seepage through the pipes in ordinary ground; the internal pressure would prevent this.

(9015) H. R. says: Will you inform me of the effect steam will have in extinguishing fire in a building, i.e., If fire should be discovered in a room 50 x 100, and the steam from a 4 x 16 foot boiler under 80 pounds presure would be exhausted into the room through a 1½ or 2-inch pipe, would the steam have a tendency to extinguish the fire, or only be an obstacle to fighting it in other ways? A. Steam has been long in use for extinguishing fires in factories, and is considered of great importance in saving the water damage by the sprinkler system. The steam pipes should have valves at the different stories on the outside of the building, of easy access, with a main valve at the boiler. A room 50 x 100 feet should have two or three nozzles 1¼ inch.

(9016) L. L. Says: 1. In No. 13, dated March 28, you state that April moon will be full on the 15th; how can an eclipse occur April 11? A. An eclipse of the moon cannot take place four days after the full moon. The date for full moon in our issue of March 28 was a misprint. The moon was full April 11, and the eclipse occurred the same night. 2. How many seconds does it take a wireless message to cross the Atlantic, and how long for the same distance per wire? A. It is not supposed to require even one second for a signal to pass across the Atlantic Ocean by wireless telegraph. The speed is probably only comparable with that of light. 3. Arctic explorers state that after the sun has set and twilight gone, it would be dark if it were not for the aurora borealis; where is the moon, and why is it never mentioned by them? A. We were not aware that Arctic explorers "never mention the moon" as shining above the horizon in the Arctic night. It passes around the sky in 29 days, and is above their horizon one-half of that time each lunation.

(9017) A. S. Co. says: Please advise how to generate hydrogen gas in small quantities for experimental purposes. A. Hydrogen is best generated from granulated zinc and hydrochloric acid, by chemical action. The acid furnishes the hydrogen. Put a handful of granulated zinc in a bottle and pour water enough into the bottle barely to cover the zinc. Have a stopper for the bottle with two holes, through one of which a "thistle" tube is passed nearly to the bottom, and through the other of which a bent glass tube is put just reaching through, to which a piece of rubber tubing is attached to lead the hydrogen to a receiver for storing it. Pour in some of the acid, and a bubbling will begin. When all the air is out of the bottle, the gas may be passed to the receiver. Do not collect mixed air and hydrogen. An awful explosion may be produced by this means. You would better get Remsen's "Chemistry," and study in detail the method of handling gases before attempting such work. There is too much danger of accident.

NEW BOOKS, ETC.

THE NEW INTERNATIONAL ENCYCLOPEDIA. Editors Daniel Coit Gilman, LL.D., Harry Thurston Peck, Ph.B., L.H.T., Frank Moore Colby, M.A. Vol. VIII. New York: Dodd, Mead & Co. 1903.

Considering the scientific portions of this eighth volume of the New International Encyclopedia, our attention is first drawn to the article on "Fungi." Although brief, it must be confessed that the discussion is quite adequate. Two excellent colored plates picture the more common varieties of edible mushrooms. In the article on "Galvanometers" will be found a description of the usual types of instruments. "Garbage Disposal" is the title of a review of modern methods of disposing of refuse material. No similar article will probably be found in any other encyclopedia. The article evidently comes from the pen of an engineer, who knows whereof he writes; for it is both full and authoritative. The text is accompanied with technical drawings that show far more than half-tones. An equally good article on "Gas" will likewise be found in the work. Gas engines are discussed fully. The section on "Geology" is as good as anything we have seen in the way of a concise and clear explanation of the leading principles of a vast science. "Glassmaking" is treated both from its historical and modern industrial aspects, with some little fullness. In the matter of illustrations and printing, the high standard set by the first volumes has been maintained.

DESIGN OF DYNAMOS. By Silvanus P. Thompson, D.Sc., F.R.S. New York: Spon & Chamberlain. London: E. & F. N. Spon. 1903. 8vo. Pp. vi, 235. Price $3.50.

Prof. Thompson assures us in his preface that his notes on dynamo design are not intended to supersede the more complete handbooks on the special branch of electrical engineering of which this is only a part. The present short work, intended primarily for Prof. Thompson's own students, is purposely confined to continuous current generators. In the section on armature-winding schemes, special attention is given to series-parallel windings and to the doctrine of the equivalent ring.

MONT PELÉE AND THE TRAGEDY OF MARTINIQUE. By Angelo Heilprin. Philadelphia and London: J. B. Lippincott Company. 1903. 8vo. Pp. xiii, 335.

Prof. Heilprin was one of the first, if not the first, to ascend Mont Pelée after its first terrible eruption, and probably the first to publish in the periodicals any full scientific account of what was there to be seen. The present work comprises a complete study of the effects of the eruptions of Mont Pelée. The pictures which Prof. Heilprin took in August, give one at least a slight idea of the terrible magnificence of the volcano's outburst in August. The publishers have seen to it that Prof. Heilprin's book appears admirably printed and illustrated.

ANNUAL REPORTS OF THE WAR DEPARTMENT FOR THE FISCAL YEAR ENDED JUNE 30, 1902. Report of the Chief of Engineers. Part 2. Washington: Government Printing Office. 1902. Pp. 993-1876.

ANNUAL REPORTS OF THE WAR DEPARTMENT FOR THE FISCAL YEAR ENDED JUNE 30, 1902. Report of the Chief of Engineers. Part 4. Washington, D. C.: Government Printing Office. 1902. Pp. 2567-3265.

UNITED STATES MAGNETIC DECLINATION TABLES AND ISOGONIC CHARTS FOR 1902. And Principal Facts Relating to the Earth's Magnetism. By L. A. Bauer. Washington: Government Printing Office. 1902. Pp. 405.

ANNUAL REPORT OF THE CHIEF OF ENGINEERS, UNITED STATES ARMY. 1902. Part I. Washington, D. C.: Government Printing Office. Pp. 991.

THE THEORY OF PROSPERITY. By Simon N. Patten, Ph.D. New York: The Macmillan Company. London: Macmillan & Co., Ltd. 1902. Pp. ix, 237.

A NEW SYSTEM OF HEAVY GOODS TRANSPORT ON COMMON ROADS. By Bramah Joseph Diplock. London, New York, and Bombay: Longmans, Green & Co. Pp. 116.

KATHLAMET TEXTS. By Franz Boaz. Bureau of American Ethnology, J. W. Powell Director. Bulletin 26. Washington: Government Printing Office. 1901. Pp. 261.

A TEXT-BOOK OF FIELD ASTRONOMY FOR ENGINEERS. By George C. Comstock. New York: John Wiley & Sons. London: Chapman & Hall, Ltd. 1902. 8vo. Pp. x, 202. Price $2.50.

In the engineering curriculum, work in astronomy is a part of the course of technical and professional training of students who do not intend to become astronomers. Consequently, the instructor selects for presentation those parts of astronomical practice most closely allied to the work of the future engineers under his charge. The parts of astronomical practice most pertinent to engineering instruction seem to be, to the author, training in the art of numerical computation; in the accurate use of instruments of precision, such as the sextant and the theodolite; and in determining time, latitude, and azimuth, with portable instruments. The astronomical problems presented in the book have been found by the author well suited for school use. As a rule, in the development of formulæ no attempt has been made to deal with the general case when the solution of a particular case suffices for the problem in hand.

SEALING-WAXES, WAFERS, AND OTHER ADHESIVES FOR THE HOUSEHOLD, OFFICE, WORKSHOP, AND FACTORY. By H. C. Standage. London: Scott, Greenwood & Co. 1902. 16mo. Pp. 95. Price $2.50.

Although sealing-waxes are by no means so generally used as they once were, they are, nevertheless, so serviceable in many cases that they probably will never pass entirely out of use. Wafers were also at one time a means of sealing a letter; now, they too, have almost entirely disappeared from use. This little book gives the requisite particulars for the production of sealing-wax and for the making of wafers. Sections are added on household cements, office pastes, and adhesives for the factory and workshop. The author informs us that the recipes which he gives are those which are being daily used in the commercial world, and that they are all well tried.

THE SABBATH TRANSFERRED. By Rev. Johns D. Parker, Ph.D. With an Introduction by Rev. F. N. Peloubet, D.D. East Orange, N. J.: Johns D. Parker & Co. 1902. Pp. 242.

CONTINUOUS POWER THE NATURAL RESULT OF CONVERTING HEAT INTO WORK IN AN INSULATED EXPANSION ENGINE AT TEMPERATURES BELOW THE NORMAL OF THE ATMOSPHERE. By J. F. Place. New York: The Standard Power Company. 1903. 8vo. Pp. 48.

CONTRIBUTIONS TO THE ENCEPHALIC ANATOMY OF THE RACES. First Paper. Three Eskimo Brains from Smith's Sound. By Edward Anthony Spitzka, M.D. With 20 Text Figures. Pp. 25-71.

THIRTEENTH BIENNIAL REPORT OF THE KANSAS STATE BOARD OF AGRICULTURE TO THE LEGISLATURE OF THE STATE FOR THE YEARS 1901 AND 1902. Topeka. 1903. Pp. 1127.

SWITCH LIGHTS. By Ed. E. Sheasgreen. Illustrated by P. J. Carter. Minneapolis. 1902. Pp. 150.

BULLETIN OF THE UNITED STATES FISH COMMISSION. Vol. XXI. for 1901. George M. Bowers Commissioner. Washington. 1902. Pp. 476.

REPORT OF THE DEPARTMENT OF MINES FOR THE YEAR 1901. Western Australia. Perth. 1902. Pp. 107.

REPORT OF THE COMMISSIONER OF EDUCATION FOR THE YEAR 1900-1901. Volume I. Washington, D. C.: Government Printing Office. Pp. 1216.

DIE KUENSTLICHE KUEHLUNG. Isolation Gegen Feuchtigkeit und Fuer Elektrizitaet. Von Alphons Forster. With 20 illustrations. Vienna and Leipzig: A. Hartleben. 1903. 12mo. Pp. 256. Price $1.25.

The author of this book has treated the subject of artificial refrigeration from an eminently practical standpoint, paying particular attention to the explanation of the construction of plants in which provisions of all kinds are preserved by cold. In the division of the work which is devoted to insulation against moisture, will be found a discussion of various processes by means of which wood and building material can be protected from moisture. In his account of electrical insulation the author presents descriptions of some entirely new compositions.

DIE ZENTRALHEIZUNG. Ein Leitfaden zur Projektierung und Berechnung von Heizungsanlagen und zur Beurteilung von Projekten für Baumeister, Architekten, etc. Von Ingenieur Hugo Freiherr von Seiller. Mit 116 Abbildungen. Vienna and Leipzig: A. Hartleben. 1903. 8vo. Pp. 176. Price $1.25.

This book may be regarded as an authoritative handbook on heating plants. No similar work has ever come to our knowledge before. The book may therefore be well regarded as a desirable addition to the scant literature that even remotely bears on this subject.

CATALOGUE OF THE ANNUAL ARCHITECTURAL EXPOSITION FOR 1902-1903. Edited by William C. Hays. Published by the T-Square Club.

IGNITION DEVICES FOR GAS AND PETROL ENGINES. By S. R. Bottone. London: Guilbert Pitman. 1902. Pp. 22. Price $1.

This little handbook will be found invaluable to all amateur electricians and automobilists interested in spark coils and their workings, as well as in the other parts of an electric ignition system. The author is a practical man of experience. One of the most interesting descriptions in the book is that of a combination jump spark coil and dynamo of his own invention. Instructions are given for making both primary and secondary spark coils. The theory of their working is also clearly explained. An introductory chapter on the automobile is of considerable interest.

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Vacuum pan drum, M. Ekenberg	727,317
Valve, Wallis & Straub	727,236
Valve, F. Strnad	727,484
Valve and operating means, C. H. Peck	727,430
Valve, engine, Hibbard & Barrows	726,919
Valve, flush tank, W. Taylor	727,491
Valve, flushing, H. Webner	727,240
Valve, gas or other pipe, Root & Demarest	727,206
Valve gear for fluid operated motors, Watson & Billetop	727,515
Vapor burner, incandescent, E. Dumarest	727,535
Vegetable blanching machine, F. A. Plackmon	727,271
Vehicle brake, E. Kepp	727,379
Vehicle, motor, R. J. Urquhart	727,231
Vehicle, motor, T. L. Boyle	727,276
Vehicle top, folding, W. T. & E. Y. Temple	727,492
Vehicle, heating and lighting attachment for steam propelled, C. I. Dangler	726,875
Vehicles on loop tracks, steering apparatus for, C. M. Smith	727,222
Vehicles, shaft connecting gear for motor road, Charron & Girardot	727,289
Vending apparatus, R. C. Kelly et al	726,938
Vending machine, J. M. Jacobs	726,934
Vending machine, W. J. Rush	727,297
Vending machine, L. W. Baldwin	727,299
Vessels, apparatus for relieving grounded, G. E. Balch	727,059
Vinegar generator, R. Douglas	726,883
Vise, E. W. Fulton	727,343
Vise, bench, B. L. Williamson	727,246
Wagon brake, Young & Wolfe	727,049
Wagon discharging apparatus, W. P. Gibson	726,903
Wagon, dumping, G. W. Roberts	726,989
Wagon running gear, L. A. Wheeler	727,043
Waist former, F. S. Boedefeld	727,273
Walls and partitions for buildings, etc., construction of, W. F. Walker	727,234
Washing machine, F. C. Fette	727,120
Washing machine, J. G. L. Myers	727,409
Washing machine, D. S. & L. D. Tyler	727,497
Watch holder, F. W. Messer	727,402
Water cooling tower, A. M. Schreuder	727,461
Water heater, electrical, H. M. Hill	727,360, 727,361
Weighing apparatus, L. E. Cowey	727,299
Weighing apparatus, automatic, K. V. Berglund	727,268
Weighing machine, H. A. Dannenhoffer	727,302
Weighing machine, automatic, A. H. Canning	726,858
Well agitator, oil, A. B. Gahagan	726,899
Wheel, A. Russell	727,456
Wheelbarrow, E. F. Hull	726,931
Whiffletree, T. Lynch	727,165
Window, P. J. Hasselquist	727,135
Window, J. Horsfield	727,366
Window screen, J. Birnelin	726,851
Window screen, A. M. Scheurle	727,209
Wire machine, barbed, H. E. Schnabel	727,210
Wire reeling apparatus, J. W. Brooks	726,855
Woodworking machine, L. Morin	726,968
Woodworking machine cutter guard, F. L. Forster	727,536
Woodworking machine guide, F. L. Forster	727,537
Wrench, C. H. Spaulding	727,012
Wrench, W. King	727,153
Writing and adding machine, combined, L. Maybaum	726,959
Zinc dust producing apparatus, Convers & DeSaulles	727,297, 727,298

DESIGNS.

Dish or similar article, covered, C. J. Ahrenfeldt	36,307
Match scraper, A. B. Risley	36,309
Musical instrument body, stringed, C. E. Brown	36,308

(Continued on page 395.)

Range, Cope & Bertram	36,311
Range, cooking, A. F. Harter	36,310
Spoons or similar articles, handle for, Crees & Court	36,303 to 36,305
Statuette, R. F. Outcault	36,302
Stove, heating, Cope & Bertram	36,312
Teapot or similar article, C. J. Ahrenfeldt	36,306
Tilling, T. F. Furness	36,313

TRADE MARKS.

Antiseptic and germicide preparation, Keimol Chemical Co.	40,256
Antiseptic, germ, insect, and worm destroyer, National Medical Co.	40,257
Astringent solutions for topical application, Norwich Pharmacal Co.	40,258
Bluing, L. Cobb	40,279
Boots, shoes, and slippers, certain named, W. Strohbeck	40,236
Brooms, Joseph Lay Co.	40,285
Buffer springs, Indianapolis Bolster Spring Co.	40,292
Cameras, Seneca Camera Co.	40,243
Candy and bonbons, M. S. Baldaff	40,271
Cement, Portland, W. H. Mescrole	40,282
Cement, preparation for coating metals, etc., Toch Brothers	40,281
Chocolates, Societe Anonyme des Chocolats au Lait F. L. Cailler	40,269
Cigarettes, paper, Sphinx Turkish Cigarette Co.	40,261
Cigars, Heymann & Co.	40,262, 40,263
Cleaning and polishing preparation, Finola Manufacturing Co.	40,277
Coal, bituminous, Handy Brothers Mining Co.	40,286
Coffee, P. M. Ayvad	40,270
Compound for cure of dyspepsia, liquid, St. Jacobs Oil	40,253
Confectionery, W. F. Schrafft & Sons	40,272
Cooking utensils, C. C. Overton	40,287
Corsets, Newcomb, Endicott & Co.	40,234
Flavoring extracts, Greever-Lotspeich Mfg. Co.	40,273
Food, prepared or mixed poultry, C. W. Hugo	40,276
Fur garments, Steele Brothers	40,235
Games, D. Gailey	40,242
Gloves, Carson Glove Co.	40,233
Hair tonic, M. E. Waite	40,247
Lamp sockets, electric, H. T. Paiste Co.	40,290
Lamps, lamp globes, and shades, certain named, Chandler Specialty Manufacturing Co.	40,289
Lard, Continental Packing Co.	40,274, 40,275
Meat, fruit, vegetables, and the like, preserving material for, J. L. Sassaman	40,280
Medical compound for cure of certain named diseases, W. F. West	40,252
Medical compounds for heart stimulants, diuretics, and eliminants, E. P. Bordas	40,249
Medicinal preparations for treatment of skin diseases, liquid, Norwich Pharmacal Co.	40,254
Mineral water, chalybeate, J. N. Horne	40,268
Music rolls for automatic musical instruments, perforated, Perforated Music Roll Co.	40,245
Paint, roof, Pannill Paint and Paint Solder Manufacturing Co.	40,283
Paper, photographic, Autotype Co.	40,244
Pens, F. Donne	40,239 to 40,241
Pharmaceutical products for nervous diseases, P. C. Saul	40,250
Photographic developing preparation, Farbwerke, vormals Meister, Lucius & Bruning	40,259
Remedies, catarrhal, Pinoleum Manufacturing Co.	40,248
Remedies for certain named diseases, E. S. Staley	40,251
Remedy for certain named diseases, internal, W. C. Alpers	40,255
Rubber hose, Capen Belting & Rubber Co.	40,246
Sewing machines, attachments, and parts thereof, Singer Manufacturing Co.	40,288
Shoes, leather, G. Baker & Sons	40,237
Thread for sewing and embroidering, silk, Richardson Silk Co.	40,238
Tobacco, plug and twist, Flournoy Tobacco Co.	40,260
Tools, certain named, Walworth Manufacturing Co.	40,291
Varnishes and japans, Stewart-Mowry Co.	40,284
Washing powder, Dufur-Banzhaf Mfg. Co.	40,278
Whiskies, Wood & Bolton	40,264
Whisky, Cook & Bernheimer Co.	40,265
Whisky, Smith Bros.	40,266

LABELS.

"Anti-Nerve Kaughphy," for coffee compound, S. S. Pierce Co.	9,957
"Ap-O-ton-iko," for medicine, Ap-O-Rheuma Co.	9,963
"Bolin's Magic Cure," for medicine, N. C. Bolin	9,968
"Bolin's Pile Cure," for medicine, N. C. Bolin	9,969
"Bozone," for medicine, Bozone Co.	9,964
"Club Lithia," for lithia water, Artesian Manufacturing & Bottling Co.	9,956
"Daisy Flower Extract," for medicine, C. Napoli	9,965
"Freeman's Medicated Face Powder," for face powder, W. D. Freeman	9,973
"Graphoid," for paint, etc., L. M. Stern	9,954
"Hamadala Chips," for medicinal preparations or confections, M. Peterson	9,962
"Mallory's Scalp Treatment," for preparations for the hair, W. D. Mallory	9,972
"Pine Tree Liniment," for liniment, A. R. Armstrong	9,970
"Power," for cereal food products, Ready Bits Corporation	9,958
"Roever's Blue Naptha," for soap, H. Roever Co.	9,961
"Sughrue & Johnson U. C. T," for cigars, Sughrue & Johnson	9,955
"Smith's White Mixture," for medicine, T. E. Smith	9,967
"Steamer Basket Card," for steamer baskets, T. Martin & Co.	9,953
"The So-Safe Intestinal Remedy," for medicine, J. Reed and Z. P. Fletcher	9,966
"White House Pure Cream Baking Powder," for baking powder, Whitehouse Supply Co.	9,960
"White Oak High Patent Flour," for flour, G. Thierwechter and C. C. Zimmerman	9,959
"Wilson's Freckle Cure," for salve, I. R. Wilson & Co.	9,971

PRINTS.

"Bridge of Health," for a medicine, United Drug Co.	674
"Captives of Dyspepsia," for a medicine, United Drug Co.	672
"Egyptian Palms," for cigarettes, Oriental Tobacco Co.	668
"General Orders," for a medicine, United Drug Co.	673
"Imperial Callsaya, Hops and Port Wine," for medicine, Imperial Wine & Medicine Co.	669
"Male Attire," for men's apparel, W. C. Both	667
"Report of Private Arrowhead," for a medicine, United Drug Co.	671
"Report of Private Chang," for a medicine, United Drug Co.	670
"Star All Metal Table," for bottle-filler tables, Star Milk Cooler Co.	675
"The New Star," for filing cabinets, E. L. Krag	676

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.
Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

PROPOSALS.

SEALED PROPOSALS WILL BE RECEIVED AT the office of the Light House Engineer, Tompkinsville, N. Y., until one p. m., Thursday, May 28th, 1903, and then opened, for furnishing the material and labor necessary for the completion and erection of an oil house at the General Light House Depot, Tompkinsville, N. Y., in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to Maj. WILLIAM T. ROSSELL, U. S. A., Engineer Third Light House District.

PROPOSALS WILL BE RECEIVED AT THE Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 12 o'clock noon, May 19, 1903, and publicly opened immediately thereafter, to furnish at the navy yards, Portsmouth, N. H.; Boston, Mass.; New York; League Island, Pa.; Norfolk, Va., and Pensacola, Fla., a quantity of **electrical material, blocks, bolts, nuts, rivets,** brushes, brooms, cement, stone, canvas, dry goods, silver plated ware, crockery, glassware, **filters,** glass, **hardware, locks, hinges, tools,** crocus and emery cloth, **drawing instruments, thermometers, musical instruments, lamps,** and lamp fixtures, leather and **belting,** lumber, timber, railroad ties, **drills, taps, dies,** brass, copper, zinc, lead, iron, steel, rails, solder, **packing,** hose, **pipe covering, asbestos,** alcohol, shellac, lye, polishing paste, pipe, **pipe fittings, gauge glasses, valves,** thimbles, grommets, cork jackets, stationery, bake ovens, sponges, beeswax, waste, soap, and **platform cars.** Blank proposals will be furnished upon application to the navy pay offices, New York; Portsmouth, N. H.; Boston, Mass.; Philadelphia, Pa.; Norfolk, Va., and Pensacola, Fla. A. S. KENNY, *Paymaster General, U. S. N.* 4-27-05.

SEALED PROPOSALS WILL BE RECEIVED AT the office of the Light House Engineer, Tompkinsville, N. Y., until one o'clock P. M., Monday, May 25, 1903, and then opened, for extending and repairing the wharf at the New London Light House Depot, New London, Conn., in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application. The right is reserved to reject any or all bids and to waive any defects.
MAJOR WILLIAM T. ROSSELL, U. S. A.,
Engineer Third Light House District.